Telephony

April 20, 1935

Underground Conduit Construction

By RAY BLAIN

ESSENTIALS to be considered in planning an underground conduit job. Some short cuts that have been tried out in actual practice and have proven entirely satisfactory in the laying of underground conduit

Digging Ditch for Underground Cable by Pick and Shovel Method.

DUE TO THE FACT that very little cable construction of any kind has been undertaken by most telephone companies during the past few years, many old aerial cable leads have reached a stage of deterioration which will not permit them to give reliable service much longer. Before these aerial leads are rebuilt, underground cable can well be considered from every angle.

It is quite true that the initial cost of installing underground cable is greater than for aerial cable, although when it is considered over a term of years, the average yearly cost will probably prove less. The annual maintenance and depreciation cost of well-constructed underground cable is considerably less than is the case with aerial cable. Added to this is the security of service, for storms and fires seldom cause trouble on underground cable.

When new underground cable is decided upon, the type to be installed should then be considered. Tape-armored cable proves desirable on many jobs as does also buried lead cables without mechanical protection of any kind. Manholes and multiple conduit usually prove-in for main cables, as this arrangement has the important advantage that defective cables can be replaced or larger cables installed without disturbing the street surface.

Conduit also usually proves an advantage for lateral cable runs, although they are not generally subjected to as many changes as are the main cables. Where changes or increases in capacity are not probable, the tape-armored or lead cable buried without protection may prove desirable. The latter, however, should never be considered when there is danger from corrosion or where lead-eating gophers are prevalent as they are in some localities.

Beautiful Street Thirty-six Feet Wide Under Which Clay Conduit Was Laid.

Main conduit runs are generally constructed of multiple duct clay, although wood or fiber is also sometimes used to good advantage. Clay conduit generally comes in one, two, three, four, six and nine-duct sizes. These sizes may be doubled up to make any combination of ducts desired.

At the present time clay conduit is usually placed without a concrete slab under the run and without any top protection. The concrete top protection was

Clay Conduit Run With All Joints Securely Plastered Together. A Wide Trench Like This One Gives Adequate Space for Proper Plastering of the Joints.

formerly used but it was found that when this slab was reached by anyone making excavations it was usually believed to be something like an abandoned foundation and, in an effort to remove it, the workman injured the conduit and in some instances the cable. If any top protection is used, a creosoted wood plank will probably prove more desirable than a concrete top protection.

A common mistake, often made, is that of digging a ditch too narrow for the proper laying of clay conduit. If the ditch is to be 40 inches deep, then it should be at least 18 inches wide; and a ditch of a greater depth than this should be at least 24 inches wide. This width will permit the laying of the conduit in a good line and will give adequate space for properly plastering the joints.

The ditch should also be dug to grade, so that the conduit section will either drain from the center to each manhole or from one manhole to the other. The ditch is usually dug to a depth which will permit an earth cover of at least 24 inches over the conduit. Sometimes when a conduit run is placed under a paved street, a cover of 18 inches will suffice.

Before starting to lay clay conduit, the bottom of the trench should be leveled off and made perfectly smooth. A layer of mortar should first be placed in the ditch to bed the joint. A strip of cheesecloth or burlap should be spread out over the mortar for the joint to lay on. Two dowel pins should be used at each joint to keep the ducts in alignment. The cheesecloth or burlap should then be wrapped around the conduit and well-plastered all over with a ½-inch layer of mortar.

Creosoted wood conduit is laid on the bottom of the level trench without mortar or concrete, and with all joints broken both vertically and horizontally. Fiber conduit is placed in practically the same manner as wood, although it is frequently encased entirely in concrete.

Clay conduit can be curved slightly to clear obstructions. Special-mitered sections of conduit can be obtained for use in making sharp curves. With these special sections, a curve with a radius of 10 feet or more may be constructed. Concrete runs may also be splayed-out or even transposed by making use of these special mitered conduit sections.

Manholes and service boxes may be constructed either of concrete or of brick. Manholes of varied sizes and shapes are constructed to meet local conditions and requirements. We have found that three different sizes meet most of our requirements. They are as follows: A 6-ft. size is 6 ft. 6 ins. wide, 6 ft. long and has 5 ft. of headroom; a 4-ft. size is 3 ft. wide, 4 ft. long and has 4 ft. 8 ins. of headroom and a service box is 22 ins. by 40 ins., and usually about 3 ft. deep.

Using Asphalt Plow and Tractor to Break the Surface of Hard Ground and Make Digging Easier.

This service box has a square manhole cover and the splice can be swung above the ground level when it is being worked on. Sectional steel manhole forms can be obtained which facilitate the construction of this size manhole from concrete. Concrete inserts are placed in the walls to be used to mount the cable racks.

Concrete mixed as follows is generally used in the construction of concrete manholes of all sizes:

Walls, 1-3-6.
Floors, 1-4-8.
Roofs, 1-2-4.

By this is meant one part of cement, three parts of sand, six parts of rock, etc.

The manholes mentioned will require approximately the following amounts of material:

	Cement, Bags	Sand, Cu. Yds.	Rock, Cu. Yds.
Six-ft. manhole	12.91	1.39	2.73
Four-ft. manholes	8.22	.88	1.75
Service box, 22 ins. by 40 ins.	2.73	.31	.62

One cubic yard of sand weighs approximately 1.35 tons.

One cubic yard of stone weighs approximately 1.50 tons.

One bag of cement weighs 94 lbs.

Rock and sand are usually purchased by weight.

Manhole covers of an approved type should always be used. A round cover with an opening of 21 inches can be used with smaller cables, but with 600-pair or larger cable an opening of about 28 inches is more desirable. This larger opening makes it easier to properly rack these larger cables.

Cast-iron pipe bends with suitable top cap and cable U-guard should be used to extend lateral conduits up a pole or building wall to the cable terminal. The approved cast-iron pipe bend fits into the female end of a section of wood conduit. This joint should be well-plastered with cement or mortar.

If an underground conduit job is being carried out, in or near a fairly large town, ready-mixed concrete can probably be purchased and used to advantage. These concrete companies mix concrete in large batches at their plant and deliver it to the job in revolving mixer trucks of two or three-yard capacity. The price of this concrete delivered usually ranges from $5 to $7 per cubic yard.

The manhole form should be all ready before the concrete is ordered, and then it can be poured without delay upon its arrival. This method is considered cheaper than mixing on the job and has the advantage that it ties up the street traffic much less and avoids cluttering up streets and sidewalks.

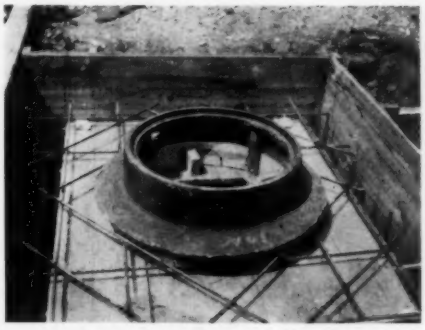
If manholes are being built in winter, concrete can be purchased which has been mixed with hot water and preheated sand and rock. This practically eliminates all danger of freez-

Construction Crew Engaged in Placing Concrete on Fiber Conduit.

Pouring Concrete in Manhole Form from Mixer Truck.

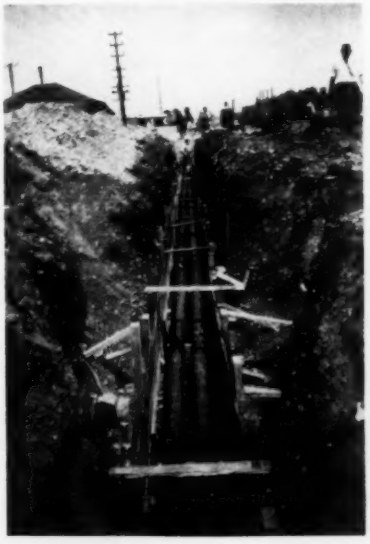
Cutting Clay Tile Filled with Sand to Prevent Breaking.

The Curve in This Tile Run Was Necessary to Avoid an Obstruction.



Manhole Form With Cover and Reinforcement Rods in Place.

Using Pipe Pusher to Push Pipe Under 40-ft. Concrete Paved Street.



Above Is Shown Fiber Conduit With Boards in Place for Pouring Concrete; Boards Were Necessary in This Case Due to Sandy Soil. To Left Is Shown Fiber Conduit Run Protected With Concrete; Since Walls of Trench Are Firm, Boards Are Not Necessary. To Right Is Seen Fiber Conduit Held in Place With Stakes and Wire Fastener.

Setting Up Sectional Steel Manhole Form. Various Sizes and Shapes of Manholes Are Constructed to Meet Different Requirements.

ing if ordinary precautions are taken. Ready-mixed concrete usually comes in a 1-3-5 mix and has been found to satisfactorily meet all average requirements for concrete manhole construction.

A good pipe-pusher is almost indispensable on a large conduit job. It can frequently be used to push pipe under pavement for lateral runs to avoid opening a ditch across the street, which is always considerable bother as well as expense. In suitable soil conditions tunnels can often be dug under solid pavement, such as the modern concrete slab, for main conduit runs. Just recently we constructed such a tunnel under a street 36 feet wide.

For laying clay conduit in one of these tunnels the best plan we have found is to lay the conduit on a 1 in. by 12-in. board, plaster all joints and pull into the tunnel with a power winch or block and falls. Boards about 10 ft. long can be wired together through holes bored near the ends of them to obtain the required length.

The main conduit run can be connected to the conduit on the boards at each end of the tunnel. Usually the boards can be spotted properly so that sections of conduit need not be cut to make these connections. This plan also permits the digging of a much smaller tunnel than is necessary if the conduit is placed by men crawling through it. Moreover, it is believed that a much better job is obtained when this plan is followed.

When it is necessary to cut conduit, we have found the best plan is to pack the ducts with wet sand. Then take a cold chisel and, tapping it lightly with a hammer, work around the conduit on a mark at the point which it is to be cut. A stonemason's hammer may be used, although only light blows may be struck; they chip the clay whereas a heavy blow causes it to crack. Much time and effort can be saved by purchasing short sections of conduit, thus avoiding the necessity of cutting pieces from standard lengths.

Brick manholes sometimes prove more desirable than concrete. The brick manhole generally proves desirable when construction over old duct lines is necessary, as the bricks can be placed around the duct lines with greater ease than can forms and concrete. The roofs of brick manholes are generally constructed of reinforced concrete.

We have found that the quickest and easiest method of laying-out manholes is to construct a square frame out of four boards of the size to which the manhole is to be dug. The hole should be dug so as to permit the pouring of a six-inch wall of concrete all around. This form can be shifted around and placed in proper position. Furthermore, the use of this form is more accurate and quicker than is the use of a tape-line or a line and stakes.

In excavating the ditch, it should be terminated about two feet from the manhole, and a small tunnel dug into the manhole for the duct entrance. This avoids the necessity of placing a board form in the trench to retain the concrete. A tile spade will be found ideal for digging these small tunnels for duct entrances.

A power trencher will prove desirable on a large conduit job out in the open where long sections of trench can be dug without striking many obstructions. Where a trench must be dug in a congested district, the pick-and-shovel method will probably prove more desirable and cheaper, although not as fast. A power trencher can usually be hired by the day when a company does not have enough work to justify its purchasing one.

This article is intended to cover briefly the main points to be considered when planning a new underground conduit job. An effort has been made also to mention a few short cuts which we have tried and found to be entirely satisfactory. It is realized that many peculiarly local conditions are met on every job, and that no detailed plan set forth here could be followed to the letter.

Laying Creosoted Wood Duct. — Cast Iron Band With Cap and U-Cable Guard to Protect Riser Cable—Laying Clay Tile in Trench.

Pouring Service Box From Concrete Mixer Truck. The Purchase of Ready-Mixed Concrete Has Many Advantages Over Mixing on the Job.

This Is the Year!

SPRINGTIME—when Nature itself is engaged in construction activities in forest and field—is a good time for the telephone man to think of and plan construction activities. Summer, now on the way, is the most suitable time of the year for construction work. This year the telephone man has more reason than he has had in several past years to be planning and doing new work.

We have learned through bitter experience that the telephone industry is not "depression proof," that customers must be sought, service sold, and the kind of service the customer wants must be provided—just as in any other business. On the whole, the lesson—hard as it was to take while we were getting it—will be of immense value to the telephone man who profits by it.

It is only natural that the telephone man could not center his thoughts on new construction in 1931, when station losses began, or in those dark and discouraging days of 1932, when the losses became acute, or in 1933, when—until late in the year—the losses continued.

IN THOSE DAYS many telephone men began to doubt if they would ever recover as many telephones as they had lost; they feared the public was losing the "telephone habit," and wondered if the business was on the down grade permanently. That mental attitude was also only natural; such losses had never happened in the business before and there was no past experience as a guide. Besides, men think discouraging thoughts at such times.

Even during 1934, when there was—except for two months or so—a fairly substantial recovery of stations, many telephone men were not convinced that the time had yet come to rehabilitate plants. They were not fully convinced that the station gain would continue, or that the future rate of gain would be substantial.

But this is 1935! The station gain—at least, during the first quarter of the year—has been very satisfactory for the industry as a whole. In a number of places, where the companies are doing intensive sales work, the gain has been exceptional. Barring a severe business recession during the year, station gains for 1935 should be extremely encouraging to the industry.

THE IMPORTANT POINT is, however, that experience is showing that the public has *not* lost the "telephone habit." The fact is that people do want their telephones back again, and they seem to be restoring them as rapidly as their earnings will allow.

The telephone business has not lost any of its "punch"—it has more now than it ever had, because managements are more keenly alive now than ever before to the necessity of continuous sales activities. The business is "up and coming." Telephone managements—like those of all other businesses—have learned a lot from the depression.

But there is one thing telephone managements should not overlook; and that is the fact that if the business is to experience full recovery, the quality of telephone service must be maintained.

OLD-TIMERS will remember that difficult period, some 15 to 20 years ago, when the great clamor against the telephone industry was complaint concerning the quality of service rendered. That situation was overcome by improving the plant and operating methods; by the installation of modern equipment, and by high-grade maintenance. Complaints against telephone service are today the exception rather than the rule.

The telephone industry cannot experience full recovery now or in the future if the quality of telephone service is allowed to deteriorate. Good service can be produced only with good equipment and plant, well-maintained.

For four years now, many telephone plants have had only the very necessary day-by-day upkeep. Old switchboards and subscribers' apparatus are four years older, and four years further away from today's standard of equipment. Besides, maintenance costs of run-down plant and old equipment are far higher than they would be on new plant.

THIS IS THE YEAR to rehabilitate and modernize! There are many reasons; some of them have been mentioned at other times in these columns. One is that many companies have stored up, during these "non-spending" years, depreciation reserves that will menace their rates unless they are used. Many companies have large cash balances that will, unless properly used, have the same effect upon their rates as what appears to be excess reserves.

Another reason—and a vital one—is that prices for material and equipment are likely to be considerably higher, and labor is likely to cost more in the future. More plant and equipment can be had for the money now than can be had in the future.

There is another reason to be added to those that may seem to be reasons principally of self-interest. The telephone industry has, in good times and bad, done its best to cooperate with everything for the good of the country. Modernizing and rehabilitation work done this year will, by giving employment both in the field and in factories, help greatly in the final push toward general recovery throughout the land.

Even that reason, when analyzed, benefits the telephone companies—the more people there are at work, the more telephones will be installed!

This is the year to modernize and rehabilitate your plant! This is the year to give that final push that will put the telephone industry well on its way to complete recovery. To both of these things, TELEPHONY dedicates this, its Spring Construction Issue.

Guying of Poles
In Telephone Plant Construction

By JOHN A. BRACKEN

PRINCIPLES OF PROPER GUYING of telephone pole leads to withstand various kinds of strains. Attachment of guys to poles and anchors. Types of anchors used. Provision for proper clearance of pole guys

TELEPHONE pole lines should be so constructed as to withstand not only the weight of aerial cable, crossarms and line wires, but also the vertical load due to sleet, ice, men working on poles, as well as some of the longitudinal strain. Longitudinal strains are caused chiefly by changes in the earth's contour, by curves, by the dead-ending of a cable or line wires, and by occasional line breaks.

The poles are also subject to side strains. Side strains are caused by wind pressure, curves and nonsymmetrical construction. When the various strains upon the telephone poles become excessive, the poles must be reinforced or strengthened by means of guys.

The principles of guying may be explained as follows: If a curve in a pole line lead is situated at the end of a straight run, as between poles No. 6 and No. 11 as shown in Fig. I, the tendency of wind pressure, sleet and various other strains on the line wires and poles is to pull those poles located on the curve toward the center of the curve; in other words, over into the road.

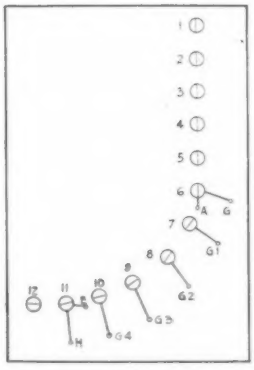


Fig. 1. Guying of Pole Lead Which Makes a Right Angle Curve.

A very simple demonstration will serve to verify this fact. Three or four short lengths of wood are set up in the ground so as to form the arc of a circle. One end of a piece of cord is rigidly fastened to something nearby and the cord drawn around each length of wood near the top, the loose end being brought out straight.

If the loose end of the cord is grasped and pulled, it will tend to assume a straight path between the point where it is rigidly fastened and the hand, and in so doing it will drag the pieces of wood over toward the center of the arc of the curve.

To overcome this effect, the poles located on the curve of a pole lead are reinforced by means of stout galvanized iron wire or steel wire rope attached to anchors buried in the ground. For instance, poles numbered 6, 7, 8, 9 and 10, respectively, in Fig. 1, are reinforced at points G, G_1, G_2, G_3, and G_4.

Pole No. 6, being located at the end of the straight run, is guyed to an additional anchor placed at point A to prevent the pole from being pulled in the direction of the line. Pole No. 11, being at the beginning of the straight run, is guyed to the additional anchor at point E, and, being the last pole on the curve, it is also guyed to the anchor located at point H.

The point on the pole to which a guy is to be attached is most important. It should be so placed that the forces due to the line wires above the point are balanced by the forces due to the wires below the point. With a pole guyed at this position, the strongest construction is obtained.

The modern system of attaching guy strand or guy wire to a pole, or a stub, is by means of the wrapped method and the eyebolt method. The wrapped method consists of fastening galvanized iron strain plates by means of galvanized wire nails to

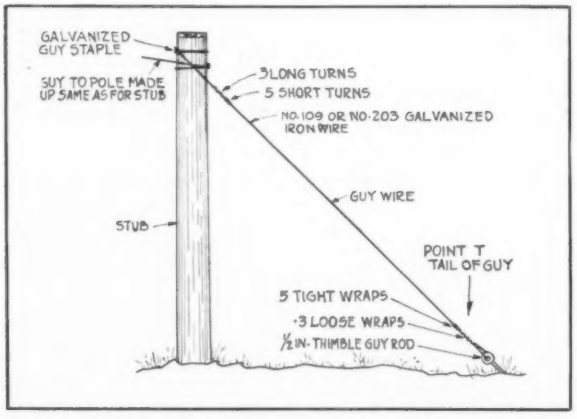

GALVANIZED GUY STAPLE
GUY TO POLE MADE UP SAME AS FOR STUB
3 LONG TURNS
5 SHORT TURNS
NO. 109 OR NO. 203 GALVANIZED IRON WIRE
GUY WIRE
STUB
POINT T TAIL OF GUY
5 TIGHT WRAPS
3 LOOSE WRAPS
½ IN. THIMBLE GUY ROD

Fig. 2. Diagram Showing Application of Wrapped Method of Guying.

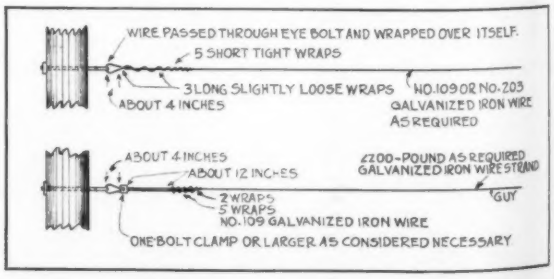

WIRE PASSED THROUGH EYE BOLT AND WRAPPED OVER ITSELF
5 SHORT TIGHT WRAPS
3 LONG SLIGHTLY LOOSE WRAPS
ABOUT 4 INCHES
NO. 109 OR NO. 203 GALVANIZED IRON WIRE AS REQUIRED
ABOUT 4 INCHES
ABOUT 12 INCHES
4200-POUND AS REQUIRED GALVANIZED IRON WIRE STRAND
GUY
2 WRAPS
5 WRAPS
NO. 109 GALVANIZED IRON WIRE
ONE BOLT CLAMP OR LARGER AS CONSIDERED NECESSARY

Fig. 3. Principal Features of Eyebolt Method of Making Guy Attachments; Also Method of Making Guy Wire and Strand Connections to Tree Attachments.

the poles at the selected point of location. The strain plates completely encircle the pole but do not overlap.

The guy strand is wrapped twice around the strain plates and the loose end clamped to that portion of

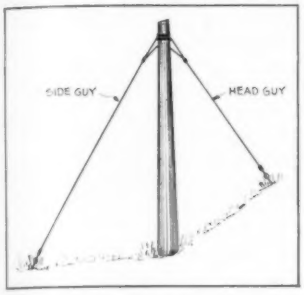


Fig. 4. Principle of Side and Head Guys.

the strand attached to the anchoring device. Where there appears to be a possibility for the strand to slip off the strain plates, a guy hook or two hooks, as required, are placed on the pole.

When galvanized iron wire is used for the pole guy, it is not necessary to use strain plates. The wire is simply wrapped twice around the pole and a staple placed over the wire. Fig. 2 shows the application of the wrapped method.

The eyebolt method of guy attachment consists in boring a hole in the pole at the required location large enough to accommodate the selected size of eyebolt. Fig. 3 illustrates the principal features of this method. After a guy wire or strand has been fastened to an attachment on the pole, it is brought down and attached to a suitable anchoring device which is usually buried in the earth.

The iron devices, known as patent anchors, are on the market in such forms as cone anchors, expanding anchors, screw anchors, plate anchors and rock anchors. Non-patent type of anchors are generally made up on the job and are called plank anchors, log anchors, concrete anchors, etc., according to the material and method of construction.

The cone and expanding type of patent anchors are in general very satisfactory when used in the average soil. There are exceptions, namely; (1) when the soil is wet and swampy; (2) when the soil caves in easily when the anchor hole is being prepared; (3) where the drainage in the vicinity of the anchor location indicates it will be wet to the depth of the anchor at certain seasons of the year.

The screw type of anchor is considered to be the most suitable patent anchor for use in swampy soil and the plate type in soils that are a mixture of sand and clay. Where it is found to be impracticable on account of rock formation to install anchors of one of these types the rock type of patent anchor is used to the best advantage. The non-patent type of anchor is used for reasons of economy and also in the few cases where the soil conditions are unfavorable to the installation of patent types of anchors.

Guy anchors are so installed that the rod attached to the anchor is, as nearly as possible, in line with the point of attachment of the guy wire on the pole without bending the anchor rod. After the anchor has been installed in the hole in accordance with the specified practices covering the particular type anchor involved, the hole is filled with soil and firmly tamped, as any air pockets left in the anchor hole tend to reduce the holding power of the anchor. As the soil is piled around the anchor rod and packed in, care should be taken not to cover the eye of the rod with dirt.

Owing to the many different forms of strain to which telephone poles are constantly being subjected—irrespective of their location in the lead—they are guyed in various ways, depending upon the need and guying space available. For this reason many different kinds of pole guys have been developed. Some of them are as follows:

BACK GUY. A back guy is one placed so as to resist a pull in the opposite direction as, for instance, at the beginning of long spans. An example of this is in the poles in a telephone line located on the opposite banks of a river which are backguyed to resist the pull of the line wire span across the river.

SIDE GUYS. This guy is a guy placed at right angles to the general direction of the pole line.

HEAD GUY. This type of guy is placed in the direction of the line.

The principle of the side and the head guy is shown in Fig. 4. A combination of the side and the head guy is generally attached to poles located on opposite sides of the road at the point where a lead crosses the road.

TREE GUYS. This is a guy extending from a pole to a tree and is used only where an anchor type of guy cannot be placed. Tree guys are attached to the trunk of a tree of satisfactory strength, or to a limb as close to the trunk as practicable. If the guy attachment is made to a forked or crotched tree, such a point of attachment is selected as will tend to enable the guy to pull the fork or crotch together rather than to split them.

Where possible, an eyebolt is used for making the tree guy attachment, as this method of attachment does not injure the tree and is most satisfactory. However, if an eyebolt cannot be used owing to the objection of the property owner or for other reasons, then the guy wire or strand is wrapped once only around the tree trunk or limb, using tree blocks (wood strips) to prevent the wire or strand from cutting into the bark and thus damaging the tree.

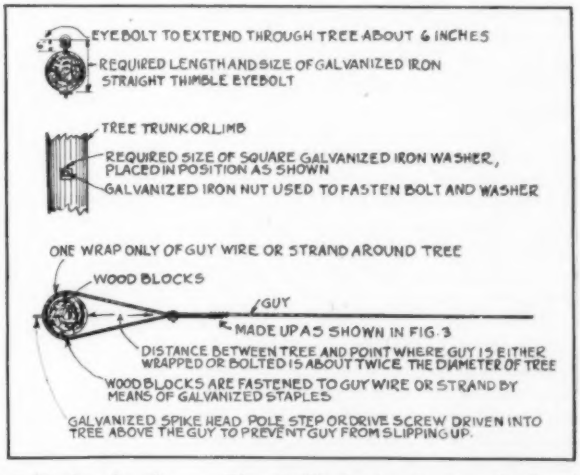

EYEBOLT TO EXTEND THROUGH TREE ABOUT 6 INCHES
REQUIRED LENGTH AND SIZE OF GALVANIZED IRON STRAIGHT THIMBLE EYEBOLT
TREE TRUNK OR LIMB
REQUIRED SIZE OF SQUARE GALVANIZED IRON WASHER, PLACED IN POSITION AS SHOWN
GALVANIZED IRON NUT USED TO FASTEN BOLT AND WASHER
ONE WRAP ONLY OF GUY WIRE OR STRAND AROUND TREE
WOOD BLOCKS
GUY
MADE UP AS SHOWN IN FIG. 3
DISTANCE BETWEEN TREE AND POINT WHERE GUY IS EITHER WRAPPED OR BOLTED IS ABOUT TWICE THE DIAMETER OF TREE
WOOD BLOCKS ARE FASTENED TO GUY WIRE OR STRAND BY MEANS OF GALVANIZED STAPLES
GALVANIZED SPIKE HEAD POLE STEP OR DRIVE SCREW DRIVEN INTO TREE ABOVE THE GUY TO PREVENT GUY FROM SLIPPING UP.

Fig. 5. Two Methods of Installing Strand Attachments to a Tree for Guying Purposes.

Fig. 5 illustrates two methods of installing a guy wire or strand attachment to a tree for the purpose of guying thereto. The method of making guy wire and strand connections to tree attachments are shown in Fig. 3.

POLE-TO-POLE GUY. A pole-to-pole guy is defined as a guy extending from one pole to another pole; that is, a guy used for transferring the load supported by one pole in a lead

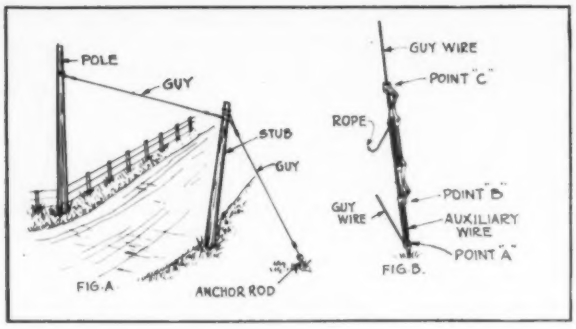


Fig. 6. Stub Guy Method of Anchoring a Pole and Method of Pulling Up Guy Wire at the Anchor.

to another. For example, a pole at which an aerial cable terminates is guyed to the next pole ahead in the open-wire portion of the lead.

STUB GUY. The location of telephone poles in a lead is often such that guy wires cannot be run directly to anchors without interferring with traffic in the vicinity of a particular pole. Such guys are usually run to a short pole, called a stub, placed nearby and the guy attached at such a height as to permit free passage underneath. This type of guy is called a stub guy. It is illustrated in Fig. 6-A, which shows the arrangement of wire guy at both pole and stub. The method of pulling up a guy wire at the anchor shown in Fig. 6-B is as follows:

An auxiliary or short length of wire is attached to the anchor rod at point *A*. One of the wire grips attached to a set of blocks is fastened to the auxiliary wire at point *B* and the other wire grip of the blocks is fastened to the guy wire at point *C*, and then the guy wire is pulled to the proper tension.

After the guy wire has been pulled up to proper tension, the end of the wire is passed through the eye of the anchor-rod thimble and the tail made up as shown at point *T* in Fig. 2. After the guy wire tail makeup has been completed, the auxiliary wire is removed.

ROCK GUY. This type of guy extends from a pole to an anchor secured in a rock. Fig. 7 illustrates the method of installing one type of rock anchor. A two-inch hole, 6¾ inches deep, is drilled into the rock, care being taken to see that the selected rock does not split or crumble away when drilled into.

The two sides of the anchor are set in the hole and the center wedge is driven into place. Then the guy wire, strand or rod, as the case may require, is attached to the anchor bolt.

STORM GUYS. A storm guy is placed for the purpose of stabilizing a pole lead during a period of storms. It consists of two opposing side guys or a similar arrangement of guys aided by two opposing head guys.

PUSH BRACE. A push brace is a form of guy that is sometimes used instead of a side guy, one of the principal reasons being that it affords an economy under certain conditions. Fig. 8 shows the method of installing a push brace.

SIDEWALK POLE GUY. A sidewalk anchor guy is a type of pole-guying used over sidewalks or other pathways where the conditions do not permit placing any other kind of guy which does not provide the necessary clearance above the sidewalk.

Fig. 9 illustrates the principles of a sidewalk type of pole guy.

SPECIAL GUYS. A special type of guy is required, for example, in anchoring a pole to an adjacent steel bridge or other structure. The method employed in attaching this type of guy to the structure depends upon the size of guy wire or strand and the nature or the condition of the particular kind of structure to which the pole is to be guyed.

The usual practice is to make up on the job the required guy attachment and fit it to the structure. Experience usually indicates under which conditions it is necessary to apply one or more of the methods of guying telephone poles which have been described in this article.

As has been previously indicated, the non-patent type of anchor is used in some cases where it is thought conditions are unfavorable for installation of the patent type of anchor, or for reasons of economy. The development and improvement of patent anchors in recent years, however, have been such that the non-patent type of anchor is not largely used.

In Fig. 10 are shown details of a creosoted block anchor installation while Fig. 11 shows a log anchor installation. The log is usually about five feet long with the anchor rod hole bored at the center of the length.

The length and width of the excavation for these anchors should be as small as possible so as to gain the best results from solid earth. The excavation should be at least six feet

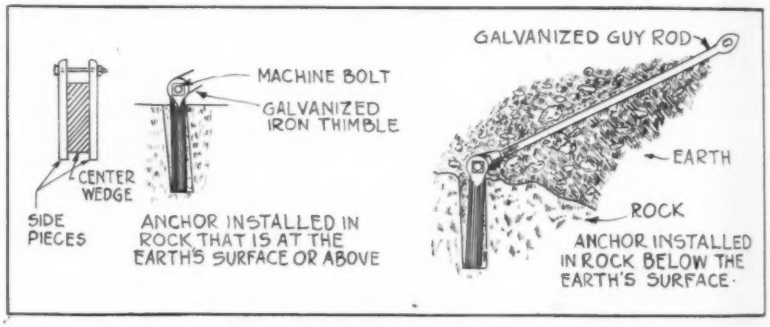


Fig. 7. Method of Installing One Type of Rock Anchor.

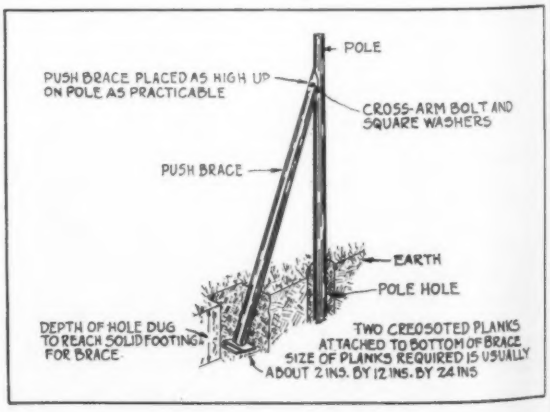

POLE
PUSH BRACE PLACED AS HIGH UP ON POLE AS PRACTICABLE
CROSS-ARM BOLT AND SQUARE WASHERS
PUSH BRACE
EARTH
POLE HOLE
DEPTH OF HOLE DUG TO REACH SOLID FOOTING FOR BRACE
TWO CREOSOTED PLANKS ATTACHED TO BOTTOM OF BRACE SIZE OF PLANKS REQUIRED IS USUALLY ABOUT 2 INS. BY 12 INS. BY 24 INS

Fig. 8. Installation of a Push Brace. For Reasons of Economy This Type of Support Is Sometimes Used Instead of a Side Guy.

deep where practicable and in no case less than four feet. All filling should be firmly tamped.

The guy rods should be set in a straight line with the guy wire and the nuts screwed as far as they will go on the rod. The eye of the guy rod should be clear of the ground at least eight inches to permit of inspection and also to prevent the rusting of the guy.

For a given "height" of pole-guy attachment, an advantage is gained by increasing the "lead" of the guy. "Height" and "lead" of a pole guy are defined as distances measured as shown in Fig. 12. For convenience in determining the size of guy required, the lead and height measured in feet are expressed as a fraction. For example, if the height of a guy is 18 feet and the lead is 9 feet, the "lead/height"=9/18, and similarly for other values.

It will be observed that diminishing the lead of guy increases the size of the guy required, and increasing the lead decreases the size of the guy required. In practice, anchor guys are preferably placed with a lead not less than the height but not more than 1¼ times the height.

Clearances of telephone pole guys is also a very important factor in guying and should be provided for as follows:

Poles should be guyed away from traveled ways in order to minimize the chance of accident.

Guys crossing over highways, streets, alleys and roads should clear the roadway not less than 18 feet at all points. Where practicable, a greater clearance should be obtained over main or through highways.

Where crossing under open-wire circuits of telephone and telegraph companies, the clearance should, as far as practicable, be measured from the lowest gain cut on the foreign (other than local telephone company) pole.

Guys crossing over driveways to barns, garages, etc., should have a clearance of not less than 10 feet.

When crossing over foot paths, sidewalks, open spaces and ways traveled by pedestrians, guys should provide a clearance of not less than eight feet.

Where guys are to cross waterways, it is usually necessary to obtain the clearance required by public regulations.

Guys crossing railroads should clear the rails by at least 28 feet or more.

Guys crossing low voltage (less than 750 volts) electric light or power circuits should clear the nearest wire not less than two feet, and those crossing high voltage circuits (greater than 750 volts) should clear the nearest wire not less than four feet. Where practicable, greater clearance should be obtained in order to insure a larger degree of safety for lineman when working upon the pole.

As an added factor of safety in guying telephone poles where the guy is exposed to electric light or power circuits the practice is to install strain insulators. Generally, strain insulators are placed at such locations as will permit effective isolation of the exposed portion of the guy wire or strand from the telephone pole and the ground or both, in which latter event two strain insulators are installed.

However, only one insulator is placed in a guy if this is considered sufficient to isolate the exposure involved. The insulator is installed about 10 feet above the ground in a down guy, the wire or guy strand being attached to the insulator in the same manner as to an anchor rod.

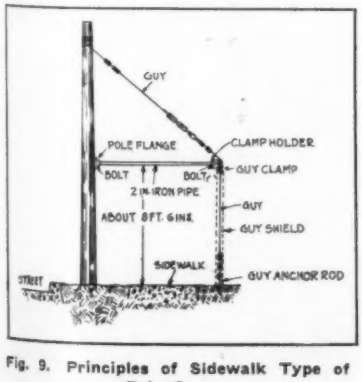


Fig. 9. Principles of Sidewalk Type of Pole Guy.

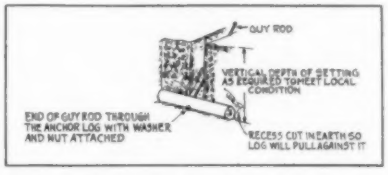

GUY ROD
VERTICAL DEPTH OF SETTING AS REQUIRED TO MEET LOCAL CONDITION
END OF GUY ROD THROUGH THE ANCHOR LOG WITH WASHER AND NUT ATTACHED
RECESS CUT IN EARTH SO LOG WILL PULL AGAINST IT

Fig. 11. Method of Installation of the Log Type Anchor.

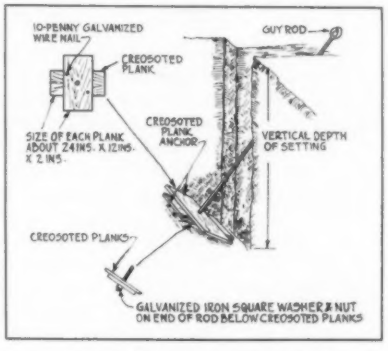

10-PENNY GALVANIZED WIRE NAIL
GUY ROD
CREOSOTED PLANK
CREOSOTED PLANK ANCHOR
SIZE OF EACH PLANK ABOUT 24 INS. X 12 INS. X 2 INS.
VERTICAL DEPTH OF SETTING
CREOSOTED PLANKS
GALVANIZED IRON SQUARE WASHER & NUT ON END OF ROD BELOW CREOSOTED PLANKS

Fig. 10. Details of Creosoted Plank Pole Anchor and Its Installation.

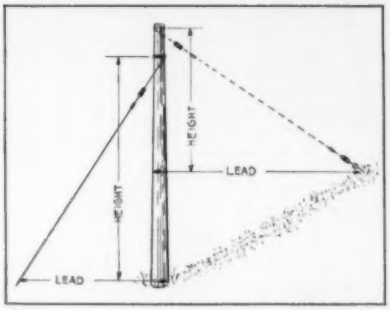


Fig. 12. Height and Lead of Pole Guy Shown Diagrammatically.

• • •

Prominent Telephone Men On Ohio Program

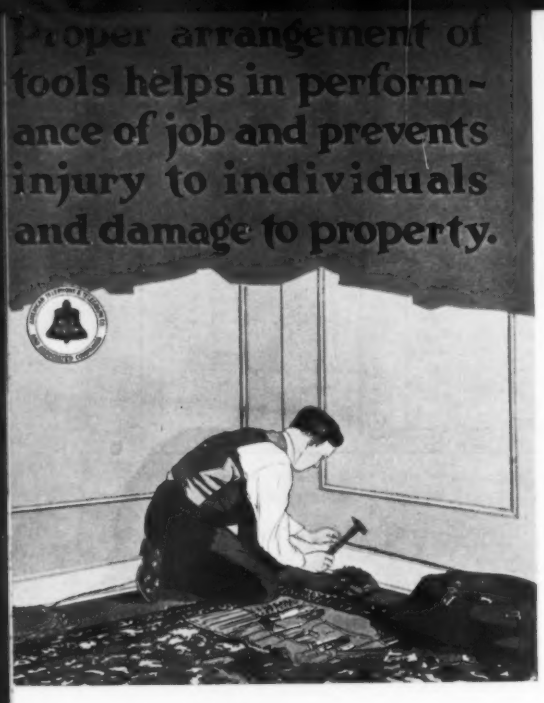
Subjects of much importance to those engaged in the telephone industry, which will be discussed by speakers of both state and national importance, are expected to be the outstanding feature of the annual convention of the Ohio Independent Telephone Association to be held at the Deshler Wallick hotel in Columbus May 1 and 2.

Among those widely known in the telephone field, who will appear as one of the speakers at the opening session of the convention, will be F. B. MacKinnon, of Chicago, president of the United States Independent Telephone Association, who will discuss "The National Situation." Other speakers at this session will be Randolph Eide, of Cleveland, president of the Ohio Bell Telephone Co., and J. F. Lincoln, president of the Lincoln Electric Co., of Cleveland. The latter will speak on "The Attempt to Socialize Business and Industry."

At the traditional banquet and dance to be held on the evening of the first day of the convention, Governor Martin L. Davey, of Ohio, will be the chief speaker.

Sessions of the second day will be marked by a commercial and new business forum at which Gustav Hirsch of Columbus and L. M. Berry of Dayton will speak and will lead in discussions. Their respective subjects are, "You Can Get Plenty of New Business" and "How We Train Our Own People to Sell."

Carleton S. Dargusch, vice chairman of the Ohio Tax Commission, is scheduled to speak on "Ohio and Taxation," a subject of wide interest in all walks of life in the state. Other speakers will be R. V. Achatz of Aurora, Ind., on "Observations on Recovery," and J. Warren Safford, of Troy, Ohio, on "Telephone Plants and Inflation."



Another Accident?

Do the Job Safely and Avoid Accidents

By JOHN G. REYNOLDS

SPRING and summer construction to most telephone companies, whether they be large or small, means a period during which construction of new plant and repairs to existing plant are made on a large scale.

Cables, whose many taped openings have caused wire chiefs plenty of worry during wet periods of weather, are removed from plant and sent to the junk cable graveyard. Pole lines and open-wire lines are straightened. Trees are trimmed. Poorly-insulated drops are replaced. In fact everything possible is done to put the plant in A-1 condition.

Most of the work is done on estimates, job orders and routine orders, and the engineers, preparing the orders, figure the costs down to the exact penny. However, in spite of all the careful figuring done by the engineers, past results show us that one cost of spring construction, which is never listed on the estimated costs, is continually bobbing up and causing additional expense—the cost of accidents. They seem to have a peculiar habit of happening at frequent and untimely intervals during spring construction jobs.

Result charts on accidents occurring to telephone workers during the spring months show that the majority of them can be classed under the following types:

Falling with or from poles, spur cut-outs, falls from ladders, electrical shock, falls from suspension strand, trench cave-ins, unloading poles, body and safety belt failures, falling from trees, solder, paraffin and wax burns, poison ivy, defective tools, infections from wire cuts and abrasions, sprains resulting from improper handling of heavy materials, creosote burns and gas in manholes.

In breaking down this list of the predominating types of spring accidents, we will discover that practically all of the accidents can be eliminated by close supervision by foremen and other supervisors.

The foreman who is on his toes, is going to make sure: that every pole is in safe condition before one of his men climbs it; that, on joint poles, the worker has plenty of climbing space and that there are no hazardous conditions; that all of the tools used by his men are in safe condition.

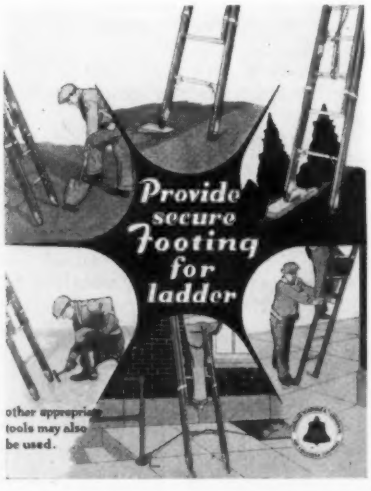
In connection with the safe condition of tools there is no better time than at the beginning of spring construction work for a period to be set aside for a thorough inspection of all the tools used by the men and the replacement of all defective tools with new ones. The foreman should also remember that he is the "key" man of his company's safety program.

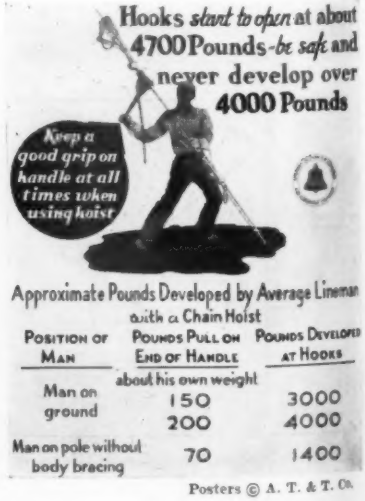
The head office can do much to ward off infection from wire cuts and abrasions, creosote burns, poison ivy rashes; solder, wax and paraffin burns; and strains resulting from handling heavy materials, by keeping the bulletin boards filled with interesting letters, bulletins and safety posters which will drive home to the employes the ways which they may use to avoid having such accidents.

The number of accidents caused from unloading poles, tree-trimming, gas in manholes, falls from ladders and suspension strand and trench cave-ins,

Place Necessary Warning Signs—Whenever Practicable Keep Out of Traffic Lanes — Watch For Approaching Vehicles
Where necessary, station flagman to warn approaching traffic.

RELEASE TENSION AT BUILDING BEFORE REMOVING SPAN ATTACHMENT
Where practicable place ladder against field side of strand




Hooks start to open at about 4700 Pounds-be safe and never develop over 4000 Pounds
Keep a good grip on handle at all times when using hoist
Approximate Pounds Developed by Average Lineman with a Chain Hoist
Position of Man | Pounds Pull on End of Handle | Pounds Developed at Hooks
Man on ground | about his own weight | 3000
150 | 4000
200
Man on pole without body bracing | 70 | 1400

Posters © A. T. & T. Co.

Let's Stop Them!

should be emphasized by the safety supervisors. Such accidents are generally either fatal or serious; in very few cases are they only minor accidents. Therefore, they cannot be overlooked.

If safety meetings are held, they should be the topics of discussion. They should be kept before the men in such an interesting manner that finally every worker will be able to unload a trillion poles without having an accident, to enter a thousand manholes and be assured that they are all free from gas, to trim trees by the dozen without a fall, and climb ladders and ride strand without a single tumble.

Everything possible should be done to hit the 16 types of spring construction accidents listed, then perhaps when the completed orders are returned to the head office, the costs will tally to a penny with the estimated costs, for there will be no costly accidents to send the figures soaring skyward.

• • •

Drivers Set Another Company Safety Record

Drivers of the New Jersey Bell Telephone Co.'s vehicles believe that a thing worth doing is worth doing right. For the fifth consecutive year they have decreased the number of motor accidents in which company cars figured, so that every year of the last five has shown an improvement over the preceding year.

The number of accidents in 1929 was 239, and in 1934 the number dropped to 69. The ratio of accidents per 100 cars was 34.8 in 1929, and in 1934 it was only 9.3

• • •

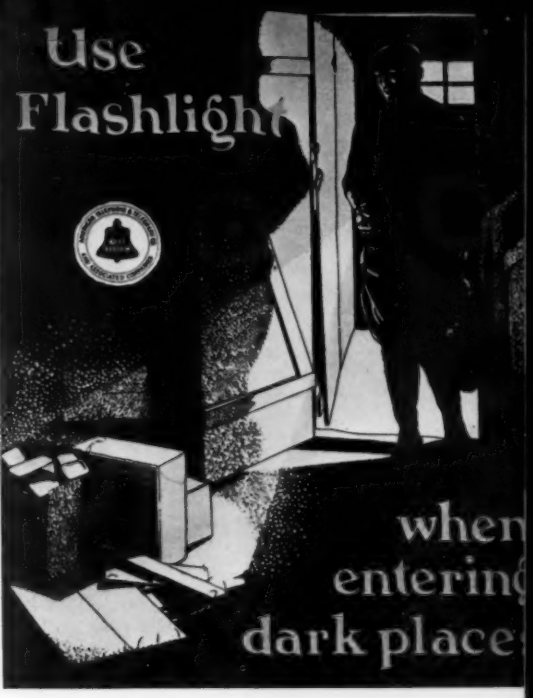
Telephone Company Has Fewer Accidents in 1934

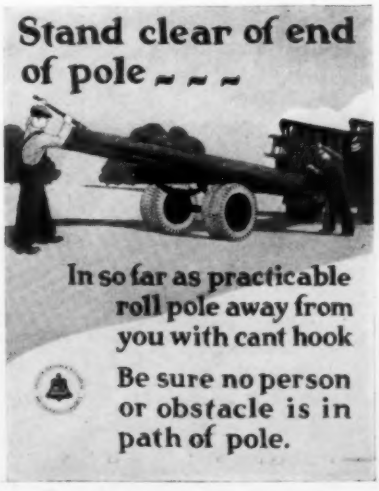
Again the Lincoln Telephone & Telegraph Co., Lincoln, Neb., has reduced the number of lost-time accidents among its employes, according to a recent report. Company records for the year 1934 show that most of the accidents occurred while the employe was working on the ground, one-third of the total accidents for the year being caused by lifting, loading and unloading poles. The Lincoln area went through the entire year without a single lost-time accident.

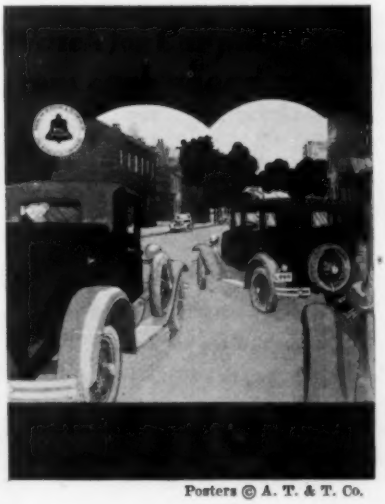
A comparison of the year 1933 with the year 1934 indicates that there were fewer lost-time accidents. In 1933 there were 11 lost-time accidents in the company, while in 1934 there were only 7. This stands as a record for, compared with the performance of other years, there were fewer lost-time accidents in 1934 than in any other year in the history of the company. In 1933 there was a total of 19 no lost-time accidents, and 11 lost-time accidents; while in 1934 there were 23 no lost-time accidents and 7 lost-time accidents.

The supply department, with headquarters in Lincoln, with a total of only three accidents for the year 1934, stands in first place in the performance of accident prevention. In 1933 this department had a total of four accidents.

During 1934 there were 117 days lost, while in 1933 there was a total of 120. In 1930 the record shows there was a total of 94 accidents, effecting a total of 484 days of lost time. In 1931 there was a total of 49 accidents in 348 days of lost time among company employes.




Stand clear of end of pole ~ ~ ~
In so far as practicable roll pole away from you with cant hook
Be sure no person or obstacle is in path of pole.



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Communication Equipment for the Iraq-Mediterranean Pipe Line

TELEPHONE plays important part in the construction of a pipe line 1,300 miles in length extending from oil field 150 north of Baghdad to Mediterranean seaport cities of Tripoli and Haifa. Stupendous task completed in the face of dangers and hardships. Communication system installed prior to laying of pipe line

THE construction of a 1,300-mile oil pipe line from the city of Kirkuk, situated 150 miles north of Baghdad in the kingdom of Iraq, in the Tigris-Euphrates Valley, to the cities of Tripoli and Haifa on the shores of the Mediterranean Sea, was successfully completed by the Iraq Petroleum Co. toward the close of 1934. This was a feat worthy of note even in this day of outstanding accomplishments.

As in most engineering projects, the telephone played an important part in the construction of this oil pipe line. Realizing that modern communication methods would be essential to the expeditious carrying out of this undertaking, the Iraq Petroleum Co. first constructed a long distance telephone line along the route planned for the pipe line.

Physical and climatic dangers and hardships added to the technical difficulties encountered in the building of the communication facilities and the laying of the pipe line, mile by mile, across the wild Syrian desert—over territories controlled by six different governments—justifying a description of the achievement as one of the most romantic exploits of modern times.

A Truck-Load of 300-Lb. Cadmium Copper Wire Leaving the Depot for Construction Party No. 2 of the Northern Division.

Construction of the long distance telephone and telegraph line was commenced in September, 1932, and completed in April, 1933. It was built in three sections and covers a total length of 996 miles. The section from Kirkuk to Haditha covers 150 miles; the second section from Haditha to Tripoli, 376 miles; and the third section, from Haditha to Haifa, 470 miles.

The system of communications adopted employs telephone and telegraph equipment operating over a land-line, which is carried by means of steel poles and runs for the greater part of its length alongside the pipe-line. For cases of emergency, and to maintain contact with various governmental, military and police authorities in towns some distance from the route, the land-line equipment is supplemented by wireless installations at selected points.

The design of the poles was in-

(*Continued on page* 31)

Beautiful View of the Haifa Terminal of the Long Distance Telephone Line Constructed by the Iraq Petroleum Co., One of the Two Mediterranean Seaport Cities Served by the Iraq Oil Pipe Line. Tripoli Is the Other City.

(*Continued from page* 26)

fluenced to some extent by the fact that the communication facilities had to be established in advance of the pipe-laying operations. The usual practice of guying the route transversely and longitudinally had, therefore, to be abandoned, since the stays would have formed a constant obstruction to motor transports proceeding up and down the line.

On account of the distance to be covered by the line, due regard had also to be given to the variety of land surfaces and climatic conditions encountered, the latter including wind velocities up to 70 miles per hour, sand storms, torrential rains, shade temperatures varying from 20 to 125° Fahrenheit and violent lightning discharges.

The poles, 25 of which are erected to the mile, are of tubular steel, set in specially designed cast-iron bases. Apart from angle guys, of which there are but few, the route is guyed longitudinally at intervals of two miles. The crossarms are of Karriwood, 48 ins. long, and have standard type fittings.

The line conductors are 300 lbs. per mile cadmium copper wire, of high breaking stress. The calculated attenuation of the line is 0.047 decibel per mile loop at 800 cycles per second. The factor of safety of the line, on the basis of a wind pressure of 15.67 lbs. per sq. ft. on two-thirds diameter of the conductor, is 2.5.

As mentioned previously, the main line consists of three sections. Each section of the line comprises two pairs, one for through working and the other for working between intermediate stations.

In addition to the main line, there are various subsidiary and branch lines, composed of single pairs of 70 lbs. cadmium copper. These lines serve to connect the oil pumping stations and depots with the company's water supply points.

The main line crosses four rivers, the Tigris, Euphrates, Orontes and Jordan. The crossing of the rivers Tigris and Euphrates is accomplished by copper-weld cables slung from lattice towers.

As a protection against static discharges resulting from lightning and sand storms, Telenduron vacuum fuse insulators have been introduced at points on the line which also serve as convenient testing points.

The magnitude of the undertaking may be judged from the following materials used in the telephone lines:

	Main Line.	Light Line.
Tubular poles	26,500	5,000
Bases	26,600	5,000
Spirals	125,000	10,000
Insulators	140,000	17,000
Crossarms	33,000	5,000
Combination brackets	33,000	5,000
Wire, cadmium copper, 300 lbs. per mile	70 tons	.....
Wire, cadmium copper, 70 lbs. per mile	.....	21 tons
Tapes and binders	250,000	27,000
Sleeves	17,000	1,600

The system of communications adopted provides for both telephone and telegraph operation. One pair of wires is reserved exclusively for through calls between the three terminal stations Kirkuk, Tripoli and Haifa, with Hadithah serving as a switching point.

The telegraph apparatus is simply teed across the line and communication is obtained over the loop, there being no earth return circuits. In consequence, there is no interference with the telegraph channels by static storms.

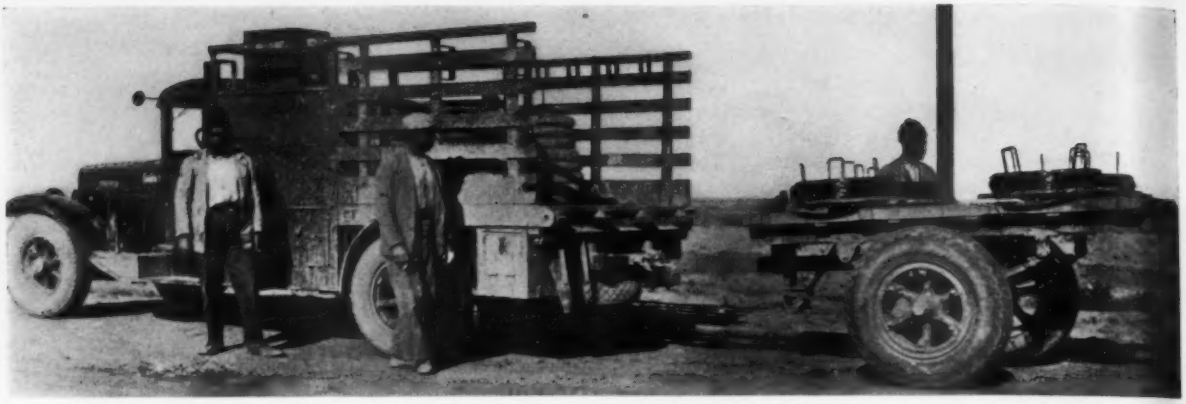
The other pair of wires is for telephone and telegraph communication between the terminal and intermediate stations, also for intercommunication between the intermediate stations. The telephone and telegraph equipments at the various stations on the intermediate lines are in parallel across the line.

Many construction problems were encountered in building the line. The first 150 miles is through a purely sand country. A pole hole digger made good time and an average of 30 pole holes were excavated per day.

Native Workmen Engaged in Setting Telephone Pole 300 Miles from Haifa.

An "H" Pole Crossing Near Wadi of the Northern Division. The Construction Gang's Camp Is in the Background.

A Construction Gang Engaged in Making Tests from Newly-Erected Section of Telephone Line Which Is a Part of the Long Distance Line Connecting Tripoli, Haifa, Haditha and Kirkuk.

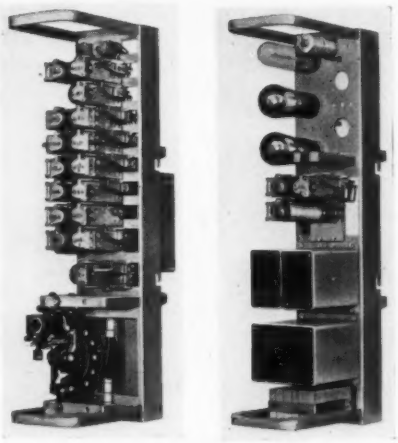


Paying-Out Wire From Service Truck Equipped With Pay-Out Reels in Building Telephone Line Along the Route of the Iraq-Mediterranean Oil Pipe Line.

In the northern section, from Hadithah to Tripoli, practically 90 per cent of the whole distance, westward from Hadithah, is undulating, gravelly soil. In this section poles were set without difficulty. Between Homs and Tripoli, a small mountain section was encountered which was traversed without any great trouble. However, all pole holes had to be blasted.

In the southern section, practically 75 per cent of the country was open desert until what is known as the lava country was reached. This brought up new problems; every pole hole had to be drilled and blasted, and the transportation of plant materials was a very difficult matter.

West of the lava section, the route crossed the Palestinian Mountain range and dropped down into the Jordan Valley. From there to Haifa the route went through the Emek Valley, of Biblical fame. The ground was of black cotton soil which, when dry, affords good machine digging.



Oscillator and Selector Group as Provided at Each Station.

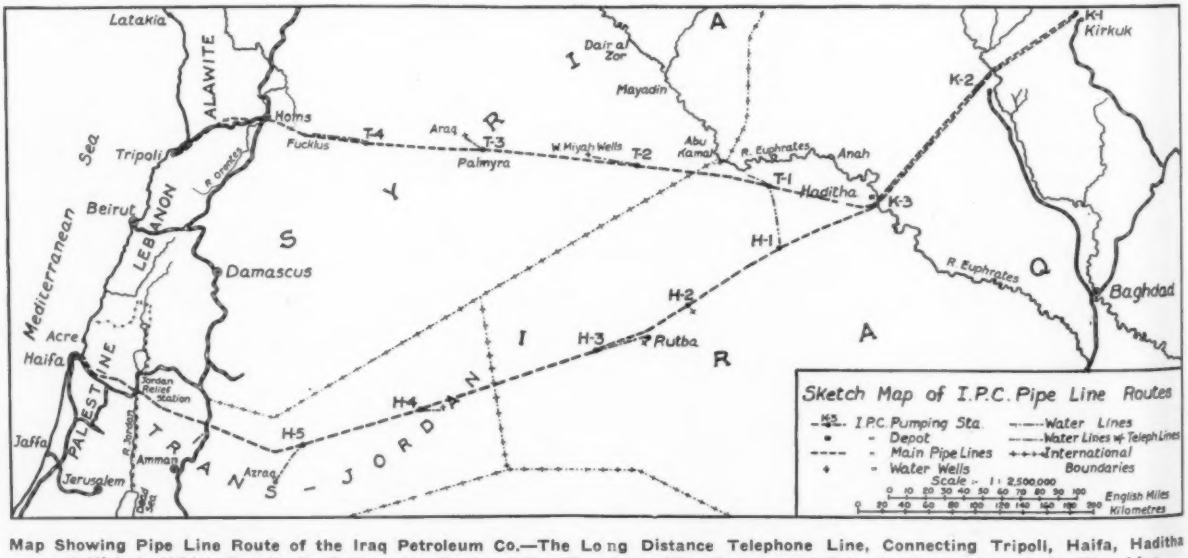
Construction was, therefore, comparatively easy in this section.

The construction work made good progress. Five gangs commenced the work, two in September, 1932, and three in November, 1932, completing the whole of the route by April 23, 1933. The machinery used was entirely of American manufacture, including International telephone construction trucks, a Buda-Hubron pole hole digger, and a Highway Four-Wheel pay-out trailer.

With the exception of the gang foremen, who were American and British, the labor employed consisted of natives of the country in which the construction took place. The six countries traversed by the line were as follows: Iraq, Transjordan, Palestine, Syria, Lebanon and Alawite.

The telephone apparatus used is the Automatic Electric Co.'s selective type, any desired selection being effected by dialing a single digit. Instead of pulses of interrupted direct current, this system employs pulses of interrupted 3,000 cycles current. This current is first applied to

(*Please turn to page* 38)



Map Showing Pipe Line Route of the Iraq Petroleum Co.—The Long Distance Telephone Line, Connecting Tripoli, Haifa, Haditha and Kirkuk, Which Practically Follows the Route of the Pipe Line, Was Constructed Prior to the Laying of the Pipe Line.

LEICH
LIFETIME SWITCHBOARDS

LEICH
LIFETIME SWITCHBOARD
1 or 2 position, as desired. Add additional sections when needed.

LEICH magneto switchboards are built to last a lifetime. They are not only built to withstand the constant wear of everyday use but worn parts are also easily replaced.

— FEATURES —

Indestructible, aluminum finish, rustproofed steel supporting frame with quarter-sawed white oak panels and rails fastened to steel frame.

All apparatus mounted on steel frame.

Key tables, plug tables and pilot rails are bakelite-covered.

Key escutcheons are bakelite-covered.

Cord racks are of steel with terminals mounted on bakelite.

Suspended or breast-plate type operators' equipment.

Low loss condenser or repeating coil cord circuits.

All terminals marked for easy identification.

This switchboard is equipped with the well known LEICH short trigger drop.

The coil of this drop may be removed from the rear without disturbing any other part or the drop adjustment.

A jack ferrule of seamless nickel silver assures long life but as an additional safeguard it may be replaced by removing two screws.

The plugs are made from a special bronze for long wearing qualities.

LEICH keys are of the T-frame type providing a substantial mounting for the nickel-silver and bronze springs.

Examine a lifetime LEICH switchboard before buying. Your copy of our new magneto switchboard is now ready. What address, please?

Sturdy rust-proofed steel frame with aluminum finish will outlast any cabinet type construction.

LEICH ELECTRIC CO. GENOA, ILL.

Explosion Hazards and Toxicity Reduced as Result of MANHOLE SURVEY

By H. S. KNOWLTON

NOTABLE PROGRESS made in eliminating explosion hazards and toxic conditions in manholes as a result of cooperative effort of New England Telephone & Telegraph Co., U. S. Bureau of Mines, electric and gas companies. Results of survey covering a period of five years

A REDUCTION in the percentage of combustible gases present in manholes from 6.1 to 1.6 has been secured during the last five years as the result of a cooperative survey in the Boston, Mass., area shared by the United States Bureau of Mines, the Boston Edison Co., the Boston Consolidated Gas Co., and lately by the New England Telephone & Telegraph Co. The manholes included in these figures were all on the Edison system, provided with natural ventilation through six or more openings per cover.

In 1933, beginning with May, 3,014 tests were made of atmospheres in 2,585 manholes of the telephone company, and there the percentage of tests showing combustible gases was 11.7. This high percentage was due in large measure to the practice of using solid covers, according to a report issued a short time ago by the Bureau of Mines.

The survey's main objectives were the elimination so far as possible of explosion hazards and the removal of toxic conditions in the manholes. The methods of collecting samples and their analyses at the Pittsburgh experimental station of the bureau have been described in previous reports. The composition of the gases found in 1933 on both Edison and New England telephone systems is shown in the accompanying table of value ranges.

Explosibility of Manhole Atmospheres

The investigation report includes a brief discussion of manhole atmospheres with respect to explosives and toxic conditions. The quantity of combustibles and percentage of oxygen in the mixture determine the explosion hazard. If 17 per cent or more oxygen is present its effect is unimportant; but if the oxygen content is below this limit, it becomes important in determining relative explosibility. If combustibles are absent, the flame of a safety lamp using naphtha as a fuel is extinguished when the oxygen content of the atmosphere drops below 17 per cent.

Methane flames are extinguished and explosions are impossible when the oxygen is less than 12 to 14.6 per cent, depending on the amount of carbon dioxide present. The higher the carbon dioxide content, the higher the oxygen value at which the flame is extinguished. Ethylene flames are extinguished when the oxygen content falls below 10 per cent, and carbon monoxide and hydrogen flames are extinguished at oxygen concentrations under about 6 per cent.

Since different combustible gases will not propagate flame and explosions are impossible when the oxygen is below certain critical values, depending on the individual gas and the proportions present, it is difficult to determine the explosion hazards of atmospheres containing less than 15 per cent oxygen, regardless of the amount of combustible. Many samples were taken which would have been explosive had the oxygen content been increased.

The carbon dioxide content of the manhole atmospheres in the five-year survey ranged from 0 to 16.7 per cent. According to Sayers, 2 per cent carbon dioxide in otherwise pure air will increase lung ventilation about 50 per cent; 3 per cent will increase it 100 per cent; and 5 per cent will increase it 300 per cent, the breathing being laborious.

An oppressive feeling and shortness of breath or panting, especially if one is working, is caused by 3 or 4 per cent carbon dioxide. Panting, headache, and flushed face are produced by a 5 or 6 per cent content. It is impossible to do much work at these concentrations. Therefore, 5.5 per cent is considered the maximum allowable concentration of carbon dioxide in manhole atmospheres where men are working.

Illuminants, as reported by gas analysis, comprise all hydrocarbons absorbed by fuming sulphuric acid. These consist mainly of ethylene, propylene, butylene, acetylene, ben-

	Percentage by Volume	
	Boston Edison Company	New England Telephone & Telegraph Co.
Carbon dioxide...	0 to 4.6	0 to 16.7
Illuminants	0 to 1.3	0 to 1.6
Oxygen	10.5 to 20.9	3.3 to 20.9
Hydrogen	0 to 15.8	0 to 15.8
Carbon monoxide.	0 to 1.2	0 to 2.1
Methane-ethane ..	0 to 13.4	0 to 12.8
Nitrogen	57 to 81.9	57.9 to 83

Table Showing Composition of Gases Found in Manholes of Boston Edison and New England Bell Companies in 1933.

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FLAWLESS GLASS
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GLASS
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- + No aging or deterioration.
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- + Sustained high dielectric strength.
- + Clear and flawless for easy inspection.
- + All surfaces are impervious to moisture.
- + This tougher, improved glass withstands rough handling.

● From coast to coast utilities are testifying to Hemingray tougher glass Insulators. They find—in Hemingray Glass—these improved features:

Clear, flawless glass which permits easy, accurate inspection for internal flaws or defects. *Proper, thorough annealing* which gives this better glass the mechanical strength to withstand severe temperature changes. *Homogeneous in character* which prevents deterioration and maintains high dielectric strength, efficient operation. These—and many other advantages—clearly point to Hemingray Glass as the ideal insulator for low cost telephone insulation service. Write for samples and descriptive bulletin today. Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

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PIN TYPE *Glass*
INSULATORS

A DEPENDABLE

Trouble Shooter

WESTON MODEL 689 CIRCUIT TESTER

Here's the instrument of broad utility, for trouble shooting . . . for checking switchboard circuits—checking continuity of the circuits — checking resistances — locating high resistance in splices—serving as a miniature wire-chief's voltmeter — and many other profitable uses. Its two ranges of 0-5,000 ohms and 0-50,000 ohms serve for practically all low and high resistance measurements. And it's Weston built . . . the best guarantee of dependability in any instrument for telephone service. Bulletin describing Model 689 and all other instruments available . . . Weston Electrical Instrument Corporation, 576 Frelinghuysen Avenue, Newark, N. J.

WESTON *Instruments*

zol, toluol and similar compounds. Gasoline vapor, if present, is absorbed to some extent by fuming sulphuric acid. The fact that gasoline vapor was reported in only a few of the Boston samples does not preclude the possibility of small amounts being absorbed and reported as illuminants.

When gasoline vapor was suspected in a manhole, atmospheric analyses were made on the sample both with and without absorption by fuming sulphuric acid before the combustibles were determined by slow combustion in contact with a heated platinum wire. From data obtained by the two methods, the quantity of gasoline vapor was computed.

The presence of illuminants in manholes causes an increase in the explosion hazard. The amounts present in the Boston survey, 0 to 3.9 per cent, are usually too small to be toxic to workers who may enter manholes unprotected.

Usually the oxygen content of manhole atmosphere is above 17 per cent (Normal air contains 20.9 per cent oxygen by volume). It may become much lower under certain conditions, and in one case at Boston it was as low as 1 per cent. Atmospheres containing 17 per cent or more oxygen offer no appreciable hazard to persons who must breathe them.

Sayers states that at 17 per cent a man at work will breathe a little faster and deeper than normal. With an oxygen content of 15 per cent men usually become dizzy, notice a buzzing in the ear, have a rapid heartbeat and often suffer from headache. Below 15 per cent the symptoms become more acute, and with 10 per cent oxygen few men are free from these symptoms, especially if working.

It is impossible to set a definite value for the minimum oxygen concentration which human beings may breathe without danger. The value depends upon the general health, stamina and work being done. It is probably safe to regard 17 per cent as the minimum oxygen concentration in which men should work in manholes for long periods.

The hydrogen content in manhole atmosphere samples in the five years varied from 0 to 44.1 per cent. Hydrogen increases the explosibility but has little effect on atmospheric toxicity.

The carbon monoxide content of the manhole atmospheres in the five-year survey varied between 0 and 5.1 per cent. Carbon monoxide is highly toxic. The presence of only 0.05 per cent may cause headache and other symptoms. It is explosive when mixed with the proper proportions of air.

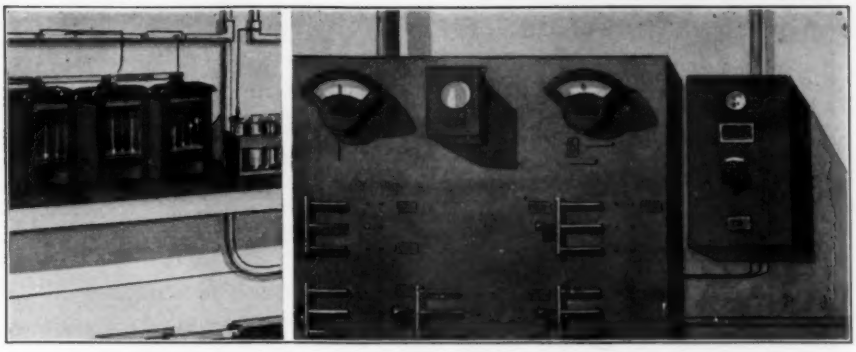
The methane and ethane content in the long survey ranged from 0 to 34.4 per cent. These materials offer no appreciable toxic hazards. If enough of either is present to reduce the oxygen content to less than 17 per cent, then the hazard is one of oxygen deficiency.

Methane and ethane are the major factors in causing manhole explosions. Propane and butane were reporated as methane and ethane in the analyses. If the analyses showed the predominating hydro-

	1929-30	1931	1932	Boston Edison Co. 1933	N. E. Bell 1933
Number of manhole tests	4,068	13,068	14,319	12,291	3,014
Number of manholes tested	1,765	9,210	10,831	9,482	2,585
Average tests per manhole per year	2.3	1.4	1.4	1.3	1.2
Cities and suburbs in which manholes were tested	20	30	30	21	16
Number of manholes showing combustibles*	107	253	204	149	260
Percentage of all manholes showing presence of combustibles	6.1	2.7	1.9	1.6	10.1
Number of tests showing combustibles	195	380	250	193	352
Tests showing presence of combustibles in percentage of whole	4.8	2.9	1.7	1.6	11.7

*Tests showing an oxygen deficiency were customarily included as they usually contain combustibles.

Summary of Manhole Tests Made in the City of Boston from 1929 to 1933, Inclusive. As a Result of Cooperative Effort, in 1933, a Total of 151 Repairs Were Made in Edison Manholes and 164 in Those of the New England Telephone & Telegraph Co.



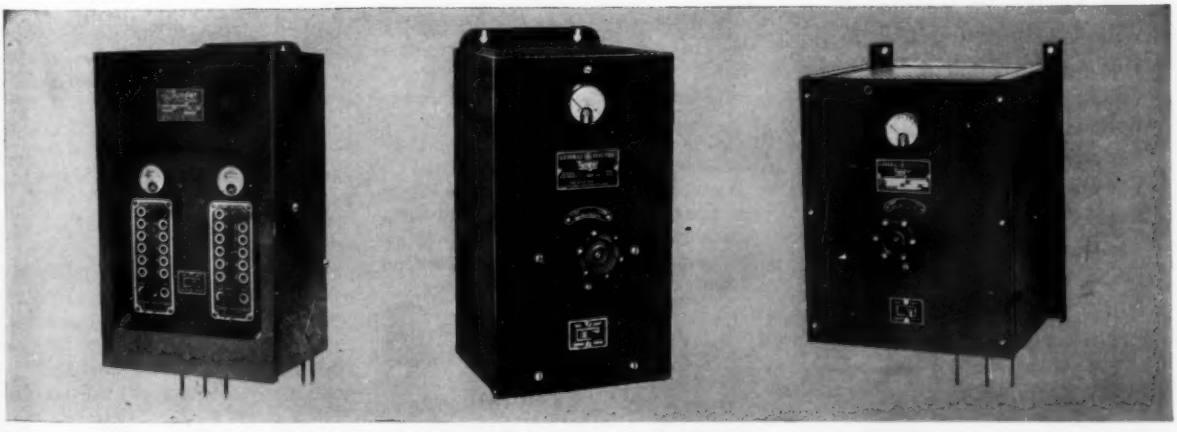
DEPENDABLE TELEPHONE SERVICE DEMANDS TUNGAR BATTERY CHARGING EQUIPMENT . . . .

Telephone service is only as good as its battery charging equipment. Behind the scenes of dependable telephone service are Tungar Battery Chargers and Copper Oxide Rectifiers. They give years of service . . . require a minimum of attention . . . assure the highest degree of operating efficiency and economy. Tungars are available for every type of Central Office and PBX application — large or small. Among the new Tungars is a 2-ampere Charger designed for use on a small PBX. Its output is filtered. It is equipped with a full-wave mercury-type Tungar Bulb.

For larger PBX's and Central Offices, a new 6-ampere Tungar Charger has been added. It is equipped with a 6-ampere full-wave mercury-type Tungar Bulb, with filtered output.

Copper Oxide Rectifiers for trickle charging include several new sizes. They provide a range of trickle rates from 10 milliamperes up to 1000 milliamperes.

For further information and specifications on G-E Tungar Chargers and Copper Oxide Rectifiers, write Section A-394, Merchandise Department, General Electric Company, Bridgeport, Connecticut.



Cat. No. 6RB6B7—12-amp. full-wave —External filter. (Cat. No. 3126680)

Cat. No. 6RB10C5—6-amp., full-wave —Internal filter. Uses full-wave Mercury Tungar Bulb.

Cat. No. 6RB23C1—2-amp., full-wave —Internal filter. Uses full-wave Mercury Tungar Bulb.

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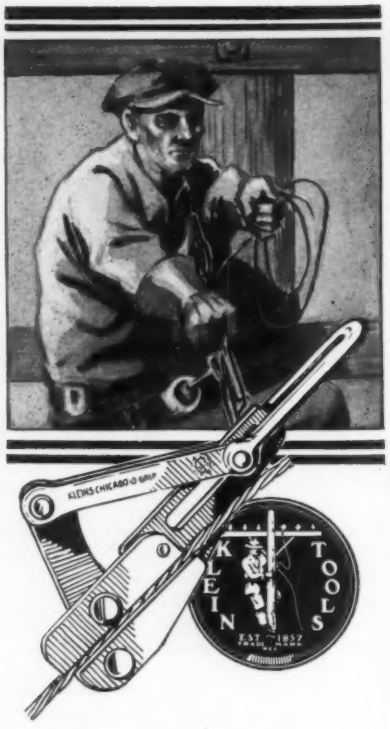
MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT



He Uses KLEINS

Ask the man on the pole—anywhere—he'll tell you his grips and climbers, safety belt and pliers, are Kleins. The Klein trade-mark on linemen's equipment is almost a tradition, based not upon superstition nor habit, but upon the exceptional service Klein tools and Klein equipment have rendered this field, "since 1857."

Foreign Distributor: International Standard Electric Corp., New York

Distributed through jobbers

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want.

- ☐ Safety for the Pole Climber.
- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ The Safety Factor on Linemen's Leather Goods.
- ☐ Pocket Tool Guide.

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.
3200 Belmont Avenue, Chicago, Illinois

carbons to be propane or hydrocarbons of a higher molecular weight, the results were reported as gasoline or other hydrocarbons. The amounts found during the survey were small but sufficient in some cases to contribute to explosions.

The nitrogen content varied from 19.5 to 85.6 per cent. Nitrogen is a colorless, nontoxic, nonexplosive gas. Its presence in high percentages may cause oxygen deficiency.

Sources of Gases in Manholes

A study of the constituents found in the Boston manhole survey in the five years showed that the contaminations may be divided as follows:

1. Gases containing hydrogen, carbon monoxide, illuminants, methane and ethane. These combinations have generally been found to be due to leakage of manufactured gas from gas mains, services and other sources. At times gases of a similar nature may have been produced by the thermal decomposition of hydrocarbon material in manhole or duct lines.

2. Gases containing high percentages of carbon dioxide, varying quantities of methane, little or no carbon monoxide, hydrogen, illuminants, and less than 17 per cent oxygen. Most of these mixtures are nonexplosive when mixed either with air of combustible propane gas. Atmospheres of this type have been termed "soil" gas because the low oxygen content appears to have been caused by reactions between the oxygen in the air and organic or other materials in the soil.

3. Gases containing gasoline vapor. In the atmosphere sampled the gasoline vapor was insufficient to produce explosions.

Contaminations from more than one source were found in many samples analyzed, and no sharp dividing line appeared between the various classes.

In 1933, the greatest number of tests showed combustibles during January and February. The highest average numbers in 1931 to 1933 were in February, followed by July, March and August. The months in which extreme hot or cold weather prevails appear to favor the accumulation of combustibles in manholes.

Gas Leaks Repaired

As a direct result of the cooperative tests in 1933 a total of 151 repairs were made in Edison manholes and 164 in New England Bell manholes, or 315 in all. The test crew reports the presence of combustibles in manholes to all interested companies at frequent intervals during the day.

The gas company immediately sends one of its cruising cars to the locations given and an inspection of the mains is started, sometimes within an hour of the report. If leaks are found, repairs are made immediately. It has been through such cooperation that the surveys have been so successful.

After two to four weeks the test crew reinspects the manholes showing combustibles, to determine if the repairs eliminated the hazards found. If the combustibles remain, a reinspection is made by the gas company. This process is continued until either the contamination is eliminated or the trouble found to be due to other causes.

The 1933 investigation was conducted by G. W. Jones, chemist of the United States Bureau of Mines, Pittsburgh, Pa.; John Campbell, superintendent of the special service department, Boston Edison Co.; and F. M. Goodwin, vice-president Boston Consolidated Gas Co. The cooperation of the New England Telephone & Telegraph Co. has been through its chief engineer, George K. Manson, R. F. Esterbrook, H. G. Grush and A. J. McCarron.

• • •

Communication Equipment for Iraq-Mediterranean Line

(Continued from page 32)

the line when a connection is to be initiated, and remains on the line throughout the conversation.

There are 10 intermediate stations and at each is a 10-line cordless board which is fitted with a dial and keys for establishing connections over the main line and linking them with the various extension telephones connected to the board.

The main offices at Haifa, Tripoli and Hadithah have 40-line common battery switchboards, while there is a 40-line magneto switchboard at Kirkuk serving some long extensions in the oil fields. These switchboards also have dials for establishing connections over the intermediate line.

A 3,000-cycle oscillator, thermionic valve receiver and selector group are provided at each station, the receiver operating on the Harris rectified re-action principle, which insures uniformity of power on the impulsing relay independent of the strength of the incoming pulses.

The selector group comprises a number of automatic telephone relays and uni-selector mechanism, the latter being stepped in accordance with the impulses received and automatically returned to its normal position upon the conclusion of each call. The neces-

sary discrimination is effected by connecting the telephone instruments at the various stations to contacts of different numbers.

During the time that a telephone connection is established between two intermediate stations, an engaged signal is displayed at the other stations on the same section and complete secrecy is ensured.

It will, therefore, be seen that there are at present four line circuits, a telegraph circuit and a telephone circuit on the "through" pair and two similar circuits on the intermediate pair. A further telephone channel can be obtained when required by phantoming the two existing pairs.

The system of communications described is extremely flexible and provides for the addition of further stations and facilities as and when required by future developments.

Oil now flowing through the Iraq-Mediterranean pipe-line of the Iraq Petroleum Co., Ltd., commences its long journey at Kirkuk, some 150 miles due north of Baghdad, and flows through a single pipe for a distance of 150 miles to Hadithah. At Hadithah the single pipe feeds two separate pipes, one conducting oil to Tripoli, 532 miles distant, and the other conveying oil to Haifa, 620 miles away.

The total cost of the undertaking was nearly £10,000,000 ($50,000,000). Some 400,000 tons of material—approximately half of which was imported through the ports of Tripoli, Basrah and Haifa—were used in all. Of this total, the weight of piping required for the line amounted to 123,000 tons.

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Independent Telephones in Oklahoma at End of 1934

Independent telephone companies in Oklahoma had 46,232 stations in service December 31, 1934. Of this number, the Western Telephone Corp. had 5,289, or approximately 11 per cent.

The total station gain of Independent companies in the state for 1934 was 339. The Western Telephone Corp. gained 278 of these, or 82 per cent.

• • •

More Favorable Rates Prevail in Yugoslavia

The government of Yugoslavia now permits the payment of telephone rentals quarterly in advance instead of semi-annual in advance, according to United States Consul Reed Paige Clark, at Belgrade. Moreover, the ministry of communications has introduced a new telephone rate schedule which is more favorable to subscribers than the one recently in force.

WEYERHAEUSER

WESTERN RED CEDAR POLES

For Economy in Line Construction

Select timber, cut from Weyerhaeuser's own virgin forests—live-peeled, seasoned, treated and finished by skilled pole makers—stocked in convenient yards to supply your needs without delay. If efficient, economical line construction is your responsibility, send for a free copy of the practical and useful Weyerhaeuser Pole Booklet.

ANNOUNCEMENT

The Weyerhaeuser Pole Company succeeds the Pole & Piling Division, Weyerhaeuser Sales Company. It gathers under one head the pole and piling activities of the various western red cedar yards and butt treating plants formerly owned and operated by affiliated Weyerhaeuser companies.

WEYERHAEUSER POLE COMPANY

RAND TOWER, MINNEAPOLIS, MINNESOTA

Represented by

WESTINGHOUSE ELECTRIC SUPPLY COMPANY

Poles

WHEN
AND
HOW
YOU
WANT THEM
FROM OUR

TWO
BIG
YARDS

MINNEAPOLIS
AND
GLADSTONE
MICH.

NORTHERN WHITE
OR
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CEDAR

PLAIN
OR
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The MacGILLIS & GIBBS CO.
MILWAUKEE, WIS.
or
KELLOGG SWITCHBOARD & SUPPLY CO.
CHICAGO

The Operators' Corner

By MRS. MAYME WORKMAN
Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

INFORMATION regarding one of the many private branch exchanges throughout country. Series No. 189

IN ADDITION to the many telephone exchanges throughout the country—housing all types and sizes of switchboard from the one-position magneto board to the 50-position common battery switchboard—we also have many private branch exchanges commonly known in telephone language as P.B.X. boards. These are also of various sizes, from the one-position board to the large P.B.X. containing 10, 20, or more positions.

Some time ago an interesting article appeared in an issue of the Edison Round Table regarding the private branch exchange of the Commonwealth Edison Co., Chicago, which, according to this article, is the largest private branch exchange in the country in complete use by a single company. It consists of a 31-position board where an average of 33,000 calls are handled daily. An additional 10,000 calls are handled at auxiliary boards.

The equipment is housed in a room having a sound-proof ceiling which materially reduces the noise and contributes to the increased comfort and efficiency of the operators. D. H. Miller, superintendent of telephone service, stated that the sound-proof ceiling has resulted in less nervousness on the part of the employes and a considerably lessened tendency to require repetition of numbers and names.

Operators selected for switchboard work by the Edison company are carefully chosen for quality of voice, experience and general ability. Another requirement is not less than one year's service with the Illinois Bell Telephone Co. This latter requirement is deemed necessary as it requires considerable time to acquaint new people with the company's methods, organization and routine.

Traffic people know quietness in an operating room is a definite factor for good service. Mr. Miller is of the same opinion. You, who are working at switchboards, and we, who have worked at switchboards know how trying noise can be and how much additional noise is added when doors and windows are opened wide during the summer months. Then, too, in summer time we have the noise of electric fans and in the toll room the problem of having the breeze from the fans blow our tickets hither and yon. All these things have a tendency to increase nervous tension.

In addition to telephone communication, the telephone department of the Edison company has charge of telephone typewriter service, installation or rental of equipment for watch service, burglar alarm service and clock and telegraph service.

We should always bear in mind that cooperation between central office operators and P.B.X. operators is essential in rendering pleasing and efficient service to P.B.X. subscribers and should be ever ready to do our part to make this kind of service possible.

Questions from Illinois Operators

1. When is a report charge applicable on a station-to-station call?
2. How close should a transmitter be worn?
3. When you are ringing on a line on a local call and the party doesn't answer, how long do you have to wait before ringing again?
4. How should a dispute of time on a toll call be handled?
5. What is the proper way to pass a collect call through a P.B.X. board?

For the answers to these traffic questions, please turn to page 46.

• • •

Flashes and Plugs—News Briefs and Comments

The Maritime Telegraph & Telephone Co., Ltd., Halifax, Nova Scotia, last October completed the replacing of poles between Pugwash and North Wallace. Some of the poles replaced were erected in 1865 by the Western Union and purchased later by the Maritime company.

A number of these poles were still sound and apparently fit for some years' use yet.

* * *

In California the public utilities pay more than half the cost of state government in a franchise tax based on their gross earnings. In 1933 the rate was increased from 7½ to 9 per cent.

* * *

The American Bar Association has prepared a 10,000-page report on the laws passed by Congress since March 4, 1933. The volume exceeds that of all federal statutes since 1789 when the government began.

* * *

The cream of business is to be found in the American homes that have a telephone, according to a Literary Digest survey. The five leading weekly magazines cover 75 per cent of the 10,000,000 homes having telephone service.

* * *

Use of the telephone by the White House has increased greatly recently, as President Roosevelt finds it essential in his conferences with Congress.

* * *

Washington is informed that three big industries—steel, telephone and oil—will spend nearly $500,000,000 in rehabilitation in 1935. This will help the employment situation.

* * *

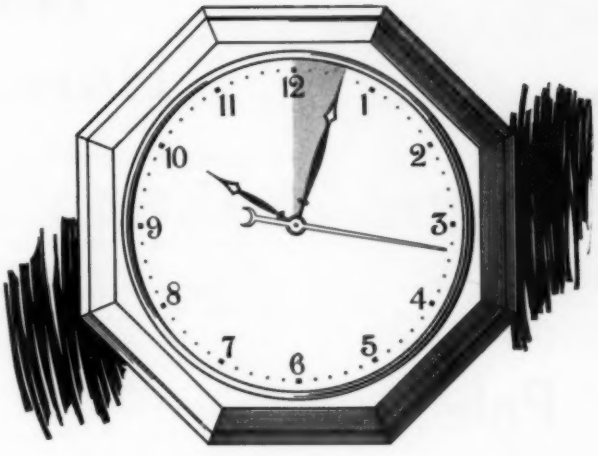
An editorial by William Randolph Hearst says government should let business alone. This is a radical change from the time when he advocated government ownership of railroads and utilities.

* * *

Eugene J. Phillips, secretary and general manager of the United Farmers Telephone & Telegraph Co., of Gardnerville, Nev., since its organization in 1911, was one of the interesting visitors to TELEPHONY's offices this week. Mr. Phillips gave a thrilling account of his trip to Chicago, starting as an airplane passenger from Reno, Nev. The plane was forced to return because of storm conditions and Mr. Phillips went by train to Salt Lake City. There he again started in an airplane, which was forced down at Rock Springs, Wyo.

Following a brief stop, the journey was resumed but storm and static conditions were such that it was impossible to keep the plane on its course and it came down at Medicine Bow, Wyo. Here Mr. Phillips boarded the same train he was on from Reno to Salt Lake City and arrived in Chicago without further adventure. After a day's stop, he went on to New York City.

Mr. Phillips plans to return to the West Coast by water, going through the Panama Canal, and *hopes* to travel by airplane from San Francisco to Gardnerville. That's perseverance for you!

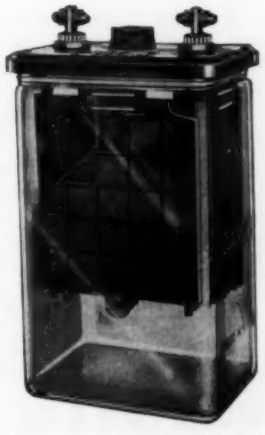


You Sell Minutes of Service . . .

. . . while we sell years of satisfactory Exide Telephone Battery service.

You expect subscribers to demand quick, clear and convenient telephone service. We expect you to demand years of absolutely reliable service from Exide Telephone Batteries. In fact, whether floated or cycle charged; whether the work is heavy or light, Exides give many years of reliable service at reasonable cost.

There is an Exide Battery for every telephone job—common battery service, emergency reserve, signalling or P. B. X. For more than 40 years Exide Batteries have been rendering satisfaction in exchanges in every part of the country.



Typical cell of the Exide Chloride Battery showing its construction

Exide

BATTERIES

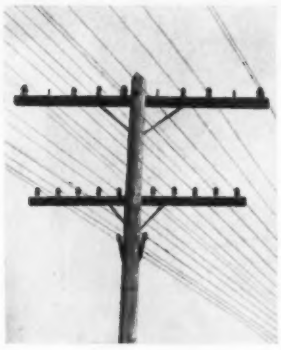
FOR EVERY TELEPHONE USE

NRA CODE

THE ELECTRIC STORAGE BATTERY CO., Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto



Pole Ponderings

CLOSELY associated as they are in actual use, have you ever thought of the great inherent difference between a coil of wire, for example, and a pole?

Wire is a "made" product, fabricated according to exacting, predetermined standards.

A pole is a "natural" product, grown by Nature under varying climatic conditions.

With the one, manufacturing and inspection are purely mechanical.

With the other, men, morals, and good judgment play an all-important part.

Buying poles is much like buying diamonds—you've got to be sure of the moral soundness of the seller.

Make no mistake, there *is* a difference in poles. And if you want *your* poles selected with good conscience, and by human standards which cannot be incorporated in specifications, buy NAUGLE POLES.

We invite your inquiry

Northern and Western Cedar
Plain or Butt-treated

NAUGLE POLE & TIE COMPANY

General Offices:
5 South Wabash Avenue
Chicago, Illinois

Branch Offices:
New York, Columbus, Minneapolis, Spokane, Boston

Main Yards and Butt-treatment Plants:
Minneapolis, Minn.; Pinconning, Mich.; Spokane, Wash.; Sand Point, Idaho; Keefers, B. C.; Arrowhead, B. C.

News From Here and There

Insurance Men Hear Telephone's Fire Value

On April 10 a committee of the United States Independent Telephone Association consisting of E. C. Blomeyer of Chicago, Chas. C. Deering of Des Moines, and Cliff C. Jones of Kansas City, appeared before the Farm Underwriters Association in Chicago, and contended that there should be a differential in fire insurance rates in favor of the farm equipped with a telephone. The Farm Underwriters Association is a committee of nine, selected by the stock companies writing farm fire insurance in all of the midwest states. It meets at intervals to consider the farm fire problems of the stock insurance companies.

The committee argued that the telephone quickly brings assistance from the neighbors and frequently from a nearby fire department—help that materially reduces farm fire losses—and that there is a dollar and cents value here that should be recognized in insurance rates.

The members of the Farm Underwriters Association listened attentively to the arguments and asked many questions, showing that they were interested in the problem and that from their standpoint its solution was not simple.

The telephone men present at this meeting told the insurance men that the Independent telephone companies firmly believed that the value of a farm telephone should be recognized in making farm fire insurance rates, and that the United States Independent Telephone Association and the various state associations expected to vigorously continue their agitation for recognition of this claim.

It was suggested that telephone men everywhere discuss this problem with their insurance men and continue to argue for a differential in rates.

A great volume of farm fire insurance is written by county mutual insurance organizations. Telephone men are urged to discuss this problem with the officers of these mutual organizations as well as with representatives of the stock fire insurance companies.

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Independent Associations for Alabama and Tennessee

The United States Independent Telephone Association is sponsoring the organization of Independent telephone associations in Alabama and Tennessee. The organization meeting of the Alabama association will be held on April 23 at the Jefferson Davis Hotel, Montgomery. As there are very few Independent companies in Mississippi, they have been invited to join with the Alabama companies in the organization of an Independent association in that state.

The initial meeting of the Tennessee association will be held at the Hermitage Hotel, Nashville, on April 25.

In a letter dated April 3 and sent to the Independent companies of Tennessee, President F. B. MacKinnon of the United States Independent Telephone Association says in part:

"The Independent telephone companies of Tennessee, that are members of our association, have decided that it is vital to the welfare of all of the Independent companies in your state to have a real, live Tennessee Independent Telephone Association during these uncertain legislative times. The new Federal Communications Commission and the activities of the Treasury Department bring up problems that the small company must meet and must have advice upon.

There should be a closer union of the Independent telephone interests, a better understanding of each other's problems, and a more helpful means of education and of dispensing telephone information. This can only be accomplished through the organization of an association to protect your mutual interests."

A similar letter was sent to the Alabama companies. The field work preliminary to the organization of these two associations was done by the late W. H. Bryant early last fall. Membership in the new state organizations, if a company's annual income is less than $50,000, carries with it membership in the national association.

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A. T. & T. Quarter Earnings Less Than Year Ago

During the first quarter of this year, the Bell System had a net gain of 112,000 telephones as compared with 109,000 in the corresponding period of 1934. The average number of telephones in service during the first quarter was 300,000 greater than for the first quarter of last year. The total number of toll and long distance calls during the first quar-

ter of this year was about the same as during the corresponding period of 1934.

Net earnings of American Telephone & Telegraph Co. for the three months ended March 31 were $30,097,288, or $1.61 a share, Walter S. Gifford, president, reported in a letter to stockholders dated April 15. This represents a decline of 9 per cent from earnings of $32,992,340, or $1.77 a share, in the first three months of 1934. As a result, the payment of $41,990,118, or $2.25 a share, in dividends, necessitated a charge of $11,892,830 against surplus, compared with $8,997,778 a year ago.

Operating revenues of the A. T. & T. Co. for the first three months were $22,964,857, compared with $23,453,467 in the same period of last year, while operating expenses and taxes rose to $19,169,254, compared with $18,913,483. Dividend revenues were $28,253,953, against $30,307,726. Net was $35,983,511 before interest deductions of $5,886,223, compared with $39,006,178 before deduction of $6,013,838 the first quarter of last year.

Consolidated net earnings of the Bell System, including the A. T. & T. and 24 associated companies, were $20,845,508 for the first two months of 1935, almost identical with the $20,854,767 in the same period last year. Of these amounts, $2,228,781 and $2,301,825, respectively, were applicable to stocks of associated companies. Remaining was $18,616,727, or $1 a share, applicable to A. T. & T. stock, compared with $18,552,942, or 99 cents a share the two months of 1934.

Operating revenues of the Bell System increased to $149,912,811 from $147,078,983 in the same period last year, but this was far more than offset by a jump in operating expenses from $101,497,292 to $105,319,939, and in taxes from $15,190,076 to $16,017,742. This resulted in a drop of operating earnings from $30,391,615 to $28,575,130. Other earnings, however, including deficit of Western Electric and earnings or deficits of other controlled companies not consolidated, amounted to $1,050,000, compared with a deficit of $750,000 in the first two months last year.

The increase in operating expenses over the first two months of 1934, is due partly to increased business but mainly to increased wages, Mr. Gifford stated.

• • •

No Extra Charge for "DeLuxe" Telephones

The minister of the interior in Argentina late last year issued a decree prohibiting the Union Telefonica from collecting the additional charge for "de luxe" telephone instruments, after January 1, 1935. In addition, the company has until July 1, 1935, to present for approval the type of telephone instrument it intends to make standard.

The GREATEST VALUE in Rubber-Covered Telephone Wire

WB

BRONZE — COPPERWELD — COPPER
OUTSIDE — INSIDE — DUCT
TERMINAL BOX AND DISTRIBUTING FRAME
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Bell Asks Court Rehearing Of Depreciation Case

The Northwestern Bell Telephone Co. has filed with the Nebraska Supreme Court a motion for rehearing of the case in which the state railway commission ordered it to set up a depreciation rate of 3.5 per cent for 1934. The company contends that the court erred in holding that it was given a full hearing by the commission and also in that it held the order appealed from as valid as against the objection that it is in conflict with paramount and inconsistent requirements of the national government.

It points out that the order purports to describe the methods of accounting to be used by the company, when those had already been prescribed by competent federal authority; and, as these are inconsistent—the federal power being supreme—the order appealed from is beyond any power possessed in Nebraska. If the motion is denied, the company will appeal to the federal supreme court.

Attorneys for the company say that the motion is made on the basic premise that the court has not passed upon or decided essential contentions which they advanced. Their position is that Congress has validly vested in a federal agency the power to prescribe the forms of accounts to be kept by all telephone companies, and has prohibited the keeping of any other accounts.

This field of accounting regulation has been occupied by the federal authority and the result is to preclude the exercise of any other authority. The finding of the court, therefore, that until the rate has been fixed by that authority the railway commission has such power, is invalid.

It is pointed out that the federal authority has adopted a system of uniform accounts which, among other things, requires that the amount of depreciation shall be determined by the application of a separately-computed composite annual percentage for each of 12 classes of depreciable telephone property, while the state commission order requires the application to all property of a single composite rate.

It is further pointed out that the federal regulations require that the company estimate the rate for each class of plant to be based upon estimated service values and service lives developed from its experience and other pertinent data, and to be such that the loss of service value will be distributed during the service life of the property.

On the other hand, the state commission order rejects the company's estimates and did not attempt to fix a rate that would distribute the service value during the service life of the property. On the contrary, it deliberately sought for and fixed a rate less than that contemplated by the federal uniform system of accounts. The federal order calls for the application of the straight-line or equal annual charges, while that of the state commission ignores this essential.

The company's attorneys complain that the court has disregarded the clear meaning of the order and the accepted issue by both parties, and has decided the case upon a basis of reasoning and authorities which would be applicable only if the order fixed a rate for any possible purpose other than accounting. Hence, it has neither accepted nor rejected this contention as to the character of the order.

The thing directed to be done was the making of accounting entries in a certain manner and upon the basis of calculations made in a prescribed manner. Whether the order is valid depends on whether the state commission has directed how accounts of telephone companies engaged in interstate commerce should be kept, especially where, as in this case, the result is to require disobedience of federal regulations.

That the court misinterpreted the issues is shown, it is stated, by the fact that it determined the competency of the commission to make the order on the authority of Smith vs. Illinois Bell Telephone Co., which held that a state commission may properly ascertain the expense of depreciation in the fixing of intrastate rates—and disregarded authorities submitted which held that the authority vested in the federal commission is full and exclusive.

The direction in the Illinois case to make a finding as to depreciation was recognition that the determination of this fact was essential in the fixing of intrastate rates, while here the Nebraska commission is seeking to regulate appellant's accounting. It is pointed out that in the Smith case the court's argument assumes the existence of plenary power in the federal government.

The attorneys say the court proceeds upon the fundamental error that the fixing of the percentage is a matter of

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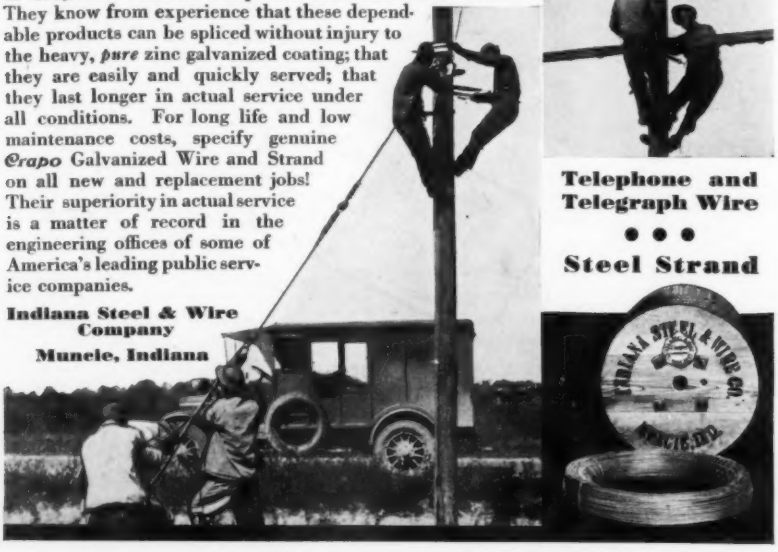

primary concern, when the significant thing is what the commission has ordered the company to do about it. This is that it shall make such entries as it decreed upon the books of the company.

On this point the federal commission has spoken differently with full authority to do so. To obey the state commission order would be not only in defiance of federal action and authority, but be placing upon the books false statements.

Records of the state commission are quoted to show that it expressly deferred assuming jurisdiction until the federal commission had fixed a rate "as far as accounting to this commission is concerned." On the matter of sufficiency of evidence the attorneys say:

"We are not here referring to any mere difference of judgment or of method. We refer to the statement of the commission that it has determined upon a depreciation rate which it finds will operate to reduce the balance in the depreciation reserve account, in itself, and in its relation to the existing depreciation in the property. It is obvious that this can be done only by an arbitrary reduction in credits to the depreciation reserve account.

"These credits consist simply of the amounts currently charged to expense on account of depreciation. The cost of property retired, less salvage, is charged to the reserve account. This account has a balance from time to time. The commission is preoccupied with this bookkeeping balance. It considers it to be too great.

"It is evident that this is sought to be done by requiring charges to depreciation expense in the future and corresponding credits to the depreciation reserve account of amounts less than the true expense. If there is anything wrong with the balance in the reserve account and exactly the true amounts on account of depreciation are annually credited to it, then whatever is wrong with the balance now will continue to be wrong with it. No order should be sustained which requires a public service corporation, for any purpose or upon any pretext, to enter upon its books amounts known and intended by the commission to be false and erroneous."

• • •

Brings Damage Suit Because Telephone Disconnected

The Lincoln Telephone & Telegraph Co., Lincoln, Neb., has been made defendant in the Nebraska courts on an unusual cause of action. Walter C. Hagerty wants judgment for $10,000, claiming that the company disconnected his residence telephone without cause, and that as a result a man who was trying to find him and offer him a job paying $150 a month, was unable to contact him.

Commissions and Courts

Columnist Cites FCC Case as Bureaucracy Example

The April 15 issue of Forbes Magazine in its column "Lifting the Washington Lid" has a reference to the Federal Communications Commission that is of interest to telephone people. "Every so often," the writer, Lawrence Sullivan, says, "bureaucracy is exposed in one of its more grotesque postures."

The story concerns the damage done to telephone lines along the Eastern Shore of Maryland by a sleet and snow storm on January 25. Engineers of the A. T. & T. Co. found that an entire new plant would be required and drew up plans for additional facilities based on a 15-year estimate.

In accordance with section 214 of the Federal Communications Act of 1934, the Bell companies involved filed application with the FCC for a certificate of public convenience and necessity covering the construction of the new and additional cable lines. The approval of the application for the certificate was, however, held up but it was approved March 25.

"Sixty days is a long time to be without telephone lines, even in Delaware, Maryland and Virginia," says Forbes' Washington observer, Lawrence Sullivan. "When, at length, public pressure for a resumption of normal service became overwhelming, a Senator and a span of Congressmen were called into the act.

"It was then discovered, according to the official record, that some of the keen-eyed youngsters in the FCC had spot-

COOK X-B UNPROTECTED POLE CABLE TERMINAL

The pressed steel corebox is of rust resisting iron, hot galvanized. The single piece face plate and fanning strips are of moulded bakelite. The studs, nuts, and washers are of tough non-corrosive Everdur metal. The snow guards, the reversible zinc cover, and the practical method of attaching and protecting the cable have proven so satisfactory that the terminal is used throughout the world.

So well has this terminal served, there are in a single city more than 10,000 Cook X-B Terminals installed.

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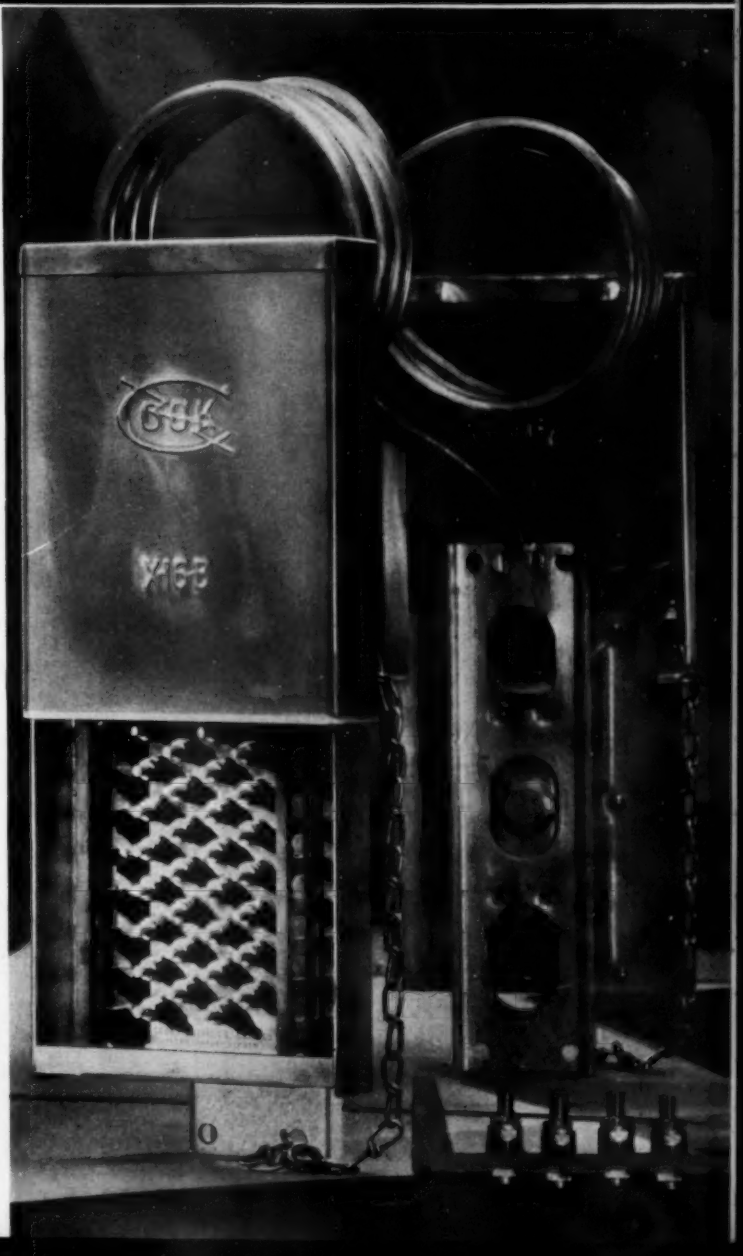

ONE INSTRUMENT FOR ALL TESTS

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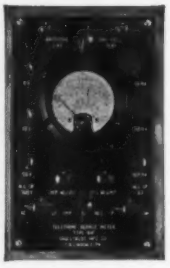

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Incorporates a standard dry cell test and power level indicator. The instrument was developed by telephone men for the exchange man and trouble shooters. Will not become obsolete. Covers the fundamental tests; accurate, dependable and moderately priced.

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Telephone Lineman pulling overhead Guy Wire with Model A Coffing Hoist

These hoists are easy to use in any position.

Capacities: ¾, 1½, 3 and 6 ton.

Weights: 14, 25, 34, 65 lbs.

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ted in the 1950 extension plan a wicked holding-company plot to saddle burdensome capital investments upon the telephone system of the tri-state peninsula.

The certificate was issued eventually —on approximately the date the work, under ordinary circumstances, would have been completed."

• • •

Testimony Presented at Hutchinson, Kans., Hearing

Following a three-day session in its investigation into the rates of Hutchinson, Kans., of the Southwestern Bell Telephone Co., the Kansas Corporation Commission on March 28 continued the hearing to Tuesday, April 16.

The hearing on March 27 devolved into a technical discussion of items entering into the $100,000 going concern value given the plant by E. T. Mahood, engineer of the company. In calculating the cost of reproducing the plant and business, Mr. Mahood added $34,000 for depreciation of the plant during the two years it would take to complete its construction. Mr. Mahood testified that on his valuation, the net return for 1933 was 4.1 per cent.

At the March 28 session testimony indicated that a $100,000 addition will be built into the Hutchinson plant by 1942, and possibly sooner. H. R. Fritz, of St. Louis, inventory and costs engineer, stated that the company was almost ready to install the dial type telephones and make a new addition to its Hutchinson plant in 1929 when the depression hit and the program had been delayed. Now, construction of the addition has been considered for 1942. The possible growth of the city, caused by recent oil activity in the area, might hasten it.

• • •

Hearing in Los Angeles Rate Case Continued to April 30

The California Railroad Commission, on April 2 and 3, with Commissioner W. J. Carr presiding, concluded the taking of testimony in the petition of the city of Los Angeles for a reduction in local rates of the Southern California Telephone Co. The case was continued until April 30, at which time the counsel for the company will be given an opportunity to cross-examine the witnesses who have testified in the city's behalf.

F. A. McNaughton, engineer for the commission, testified at a previous hearing that while the company earned a 6½ per cent return for the year ended June 30, 1934, the earnings from the Los Angeles exchange amounted to 8.9 per cent. The exchange with the next highest return was El Segundo, with 5.3 per cent. Of the remaining exchanges, 52 were operated at a loss.

Ray L. Chesebro, attorney for Los Angeles, contends that the subscribers of that city should not be required to pay rates which offset the losses in other exchanges.

At the hearing on April 3 two officials of the Southern California company testified for the first time regarding the results of the extended service

Answers to the Traffic Questions on Page 40

1. Station-to-station calls are not subject to report charges. However, in the case of a collect call filed as a station-to-station call, if the call is not completed the same day because the called station does not accept the charge and the calling party does not then agree to pay for the message, or is not available, or the calling station does not answer, this call is subject to a report charge. It is classified as a person-to-person call.
2. A half-inch from the lips.
3. If the called station does not answer within ten seconds after the first ring, ring again. Continue ringing at intervals of ten seconds until an answer is received or until it is time to give a report, unless the call is canceled or abandoned by the calling party.
4. The operator should refer the call to her supervisor. The supervisor will determine the facts by examining the ticket record and questioning the operator and, if necessary, the calling party. If the supervisor is convinced that the service was satisfactory and the charge correct, she will tell the calling party that an investigation of the records indicates that the charge is correct and she will try to secure his acceptance of it. If he still refuses to accept the charge, the supervisor will refer him to the employe locally designated to handle such a case.
5. Announce the call to the P.B.X. operator in the regular way. When the called party is reached, again announce the call as a collect call. In many cases the P.B.X. operator keeps a record of calls and if you fail to announce to her that the calling party wishes the called party to pay for the call, there may be difficulty about the bill.

plan placed in operation in the Los Angeles area a short time ago. Thomas J. Harris, general commercial engineer in charge of rates, testified that a substantial percentage of new subscribers are availing themselves of the extended service plan, although not as many as had been expected. He said the company had estimated that 15 per cent of the subscribers in outlying exchanges would change to the Los Angeles extended service system, but the number of transfers was only 7.2 per cent. He also said the number of calls between adjacent periphery exchanges is increasing. In support of this statement he reported that formerly only 23,900 calls were made between Glendale and Hollywood exchanges monthly, whereas since the new plan was put into effect the calls total 54,100.

Harry W. Hitchcock, the company's chief engineer, was questioned by Carl I. Wheat, public utilities counsel for the city, as to the expenses incurred in inaugurating the new plan and as to the effect of the plan on Los Angeles exchange costs. To this Mr. Hitchcock replied that $19,000,000 of plant equipment in periphery exchanges was made available to Los Angeles subscribers under the plan.

• • •

Bell in Mississippi Granted 30-Day Injunction

In an order issued March 28, Justice Virgil A. Griffith, of the Mississippi Supreme Court serving in the role of a chancellor, granted a 30-day injunction to the Southern Bell Telephone & Telegraph Co. against the rate reduction ordered March 6 by the Mississippi Railroad Commission. On March 22 Chancellor V. J. Stricker, of Jackson, Miss., denied a temporary injunction and the plea was carried to Justice Griffith.

A bond of $25,000 was posted by the Southern Bell company to protect subscribers in the event that the reduced rates eventually go into effect.

The court stated that the injunction was granted in order to give the telephone company sufficient time to amend its original chancery bill, which was held by Chancellor Stricker to be insufficient to warrant even a temporary suspension of the rate reduction of 18 per cent ordered by the commission. The expiration date of the injunction was given as April 26.

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Commission Files Appeal From Judge's Order

An appeal from Judge W. C. Harris' order in the Southern Bell Telephone & Telegraph Co. rate reduction case has been filed in the North Carolina Supreme Court by the North Carolina Utilities Commission, it is reported.

Judge Harris granted the telephone company a writ of supersedeas in staying the commission's reduction order scheduled to take effect January 1. The appeal, if pressed, will be for the purpose of asking the supreme court to review Judge Harris' ruling.

Trial of the original appeal of the Southern Bell company from the commissioner's reduction order will not be affected by the latest court move.

The rate reduction would amount to a $321,000 annual saving to about 78,000 telephone customers in the 58 exchanges operated by the Southern Bell in North Carolina. The telephone posted $300,000 bond pending the outcome of the case.

• • •

High Court Denies Louisiana Rate Appeal

The Louisiana Supreme Court on April 2, in an opinion written by Associate Justice John B. Fournet, denied the application of the Southern Bell Telephone & Telegraph Co. for an order staying the order for reduction in rates issued by the Louisiana Public Service Commission. There was no dissenting opinion returned by the court.

Justice Fournet stated in the opinion and ruling that Judge W. Carruth Jones, in the East Baton Rouge parish district court, had not abused the discretion and authority vested in him when he originally upheld the order of the commission and denied the injunction requested.

After Judge Jones refused to grant the injunction, the telephone company applied to the supreme court for a writ of mandamus, to compel Judge Jones to enjoin the rate reduction.

Justice Fournet cited Section 5, Article 6 of the state constitution as providing that the orders of the Louisiana Public Service Commission fixing or establishing rates shall go into effect at such time as may be fixed by the commission itself; that when put in effect they shall be complied with unless set aside by the order of a court.

The telephone company's action followed an order of the commission of March 2 decreeing a reduction in telephone service rates in Louisiana amounting to nearly 20 per cent. Senator Huey P. Long associated himself with the commission as its counsel and fixed his fee at $20,000, which the telephone company would have to pay in addition to some $60,000 for inquiry costs, auditing and technical services in case the rate reduction is upheld by the courts.

In trial of the case before Judge Jones, the Southern Bell attorneys declared that the reduction in rates would cost the company more than $600,000 a year in revenues, and that its earnings on its investment in Louisiana would barely go about 2 per cent. Against this, the commission argued that the

(*Please turn to page* 54)

Tree Trimming Days Are Here!-
Use BARTLETT
for ease of operation and protection to the operator
The Tree Trimmer: A powerful tool for line clearance. Will sever any branch up to 1¼" in diameter with slightest effort. Very light in weight. Mounted on 1¼" octagon pole with a round ferrule at lower end to attach extra sections, or with a rectangular pole and ferrule.
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The Pole Saw: Has special cut teeth that retain their sharpness. Makes sawing rapid and effortless . . . extensions same as those used for tree trimmers.
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"Telephony's" Engineering Data.

By B. C. BURDEN.

Index, Cable Plant Construction.
April 20, 1935.
No. 6-B, Page 22.

Such a tester, as shown in Fig. 17, will furnish the following test features:

1. It will furnish a tone for identifying cable pairs.
2. It will serve as a convenient source of battery to use in cases where an operator's transmitter is used for talking.
3. It provides a signaling circuit which can be connected to a subscriber's cable pair, or to a vacant pair which is temporarily connected to a switchboard line at the office. (This is often useful on complicated cutovers, where it is desirable that the wire chief be able to talk to the splicer during the progress of the splicing.)
4. It provides a convenient source of battery for use in testing cable pairs for moisture, shorts, grounds, opens, etc.

The theory of operation of the tone test set shown in Fig. 17 is as follows:

When switch A is closed the 4½ volt battery is connected in series with the windings of the buzzer, the contacts of the buzzer, and the primary of the induction coil. This causes the buzzer armature to be attracted, opening the series contact, interrupting the current flowing through the buzzer windings and causing the armature to fall back, and this again closes the contact and the cycle is repeated. The rate of interruption of the circuit is dependent upon the natural period of the buzzer and is several hundred cycles per second.

The interruption of the current flowing in the primary winding induces an alternating voltage across the secondary winding of the induction coil, this alternating voltage being impressed across line terminals, L_1 and L_2 through the 0.1 mf. condenser shown. The purpose of this condenser is to permit the alternating current to pass out to the pair under test but to prevent direct current from the cable pair (in the case of working common battery lines) from passing into the secondary which, were the condenser not there, would interfere with the normal working of the central office equipment.

The purpose of the 1 mf. condenser shown is to absorb the spark created when the buzzer contacts open, thus reducing pitting of these contacts. The signaling buzzer shown can be made from an old ringer with the gongs removed and the tapper cut off.

Testing for Defective Pairs

Some companies, in placing new cable, test all the conductors in the cable for grounds, short-circuits, crosses, and opens, before starting splicing operations. This requires considerable time. Some companies contend it is so seldom that trouble is encountered in new cable that it is better to splice the cable according to the plan and test it after it is completed. Faulty pairs are then located (where possible) and the fault corrected.

The principal disadvantage of this latter practice is the fact that pairs that are bad in one section of cable may be

"Telephony's" Engineering Data.

By B. C. BURDEN.

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spliced to pairs that are good in some other section; and if the nature of the trouble is such that it cannot be readily located and cleared, then the total number of bad pairs in the cable is increased. Bad pairs in adjacent sections should be spliced together where possible.

Tests for defective pairs are made with an operator's receiver connected in series with a battery. The battery in the

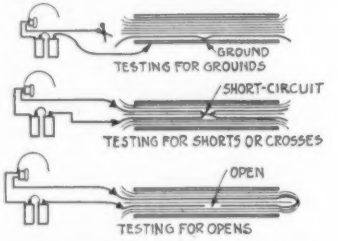

FIG. 18. TESTS FOR DEFECTIVE CABLE PAIRS USING BATTERY AND A HEAD SET.

tone test set terminals, L_3 and L_4, is suitable for this test. Fig. 18 illustrates how each of the tests is made.

Cable manufacturers mark the ends of cable that contains defective pairs, and the pairs in trouble are specifically identified by means of small linen tags which state the nature of the trouble. In general, defective pairs in adjacent cable sections should be spliced together. After the cable is all spliced an attempt should be made to locate these defective pairs.

In making tests on a section of cable be sure that the distant end of the cable is clear. It is generally necessary to stagger cut the several layers of conductors as shown in Fig. 19, to insure that the conductors are not grounded, crossed, or short-circuited at these points.

Setting Up a Talking Circuit

Identification of cable pairs is required between the main distributing frame and the termination of the various cable

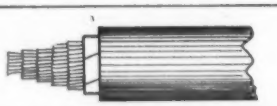

FIG. 19. CLEARING END OF CABLE BY STAGGER-CUTTING CONDUCTORS

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By B. C. BURDEN.

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April 20, 1935.
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pairs and at points where a cable branches or changes size. Fig. 20 illustrates schematically the typical section of cable and how some splices will be of the "random" type while others will require identification.

Before starting to identify the pairs in a cable it is necessary to establish a "talking" circuit between the splicer and his helper. This is handled as follows: The splicer's helper goes to the main distributing frame, or cable terminal from

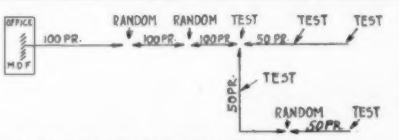


FIG. 20. RANDOM AND TEST SPLICES.

which identification is desired. The splicer at the distant end of the cable connects his head receiver across a pair, which is to be used as the talking circuit, and connects one side of this pair in series with the tone terminal, L_1 and L_2, and ground as shown in Fig. 21.

The tone is then started and the helper connects one side of his receiver to ground. With a test pick he then tests until he hears the tone, after which he connects his receiver across the pair and advises the splicer that the talking pair has been located.

In establishing a talking circuit in a cable which contains working lines, the splicer searches for vacant pairs by connecting a condenser in series with his head receiver and

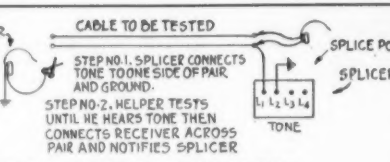
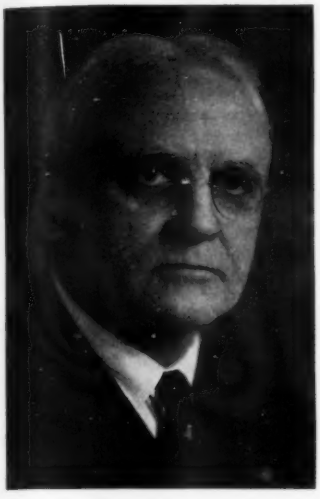

HELPER
CABLE TO BE TESTED
SPLICE POINT
OPERATOR'S RECEIVER
STEP NO. 1. SPLICER CONNECTS TONE TO ONE SIDE OF PAIR AND GROUND.
SPLICER
STEP NO. 2. HELPER TESTS UNTIL HE HEARS TONE THEN CONNECTS RECEIVER ACROSS PAIR AND NOTIFIES SPLICER
TONE

FIG. 21. SELECTING A TALKING PAIR

ground, and touching each conductor until he finds a vacant pair. Vacant pairs will give only a slight click in the receiver, while working pairs will give a loud click (on common battery boards).

After finding a vacant pair the splicer connects his tone from one side of the pair to ground and his receiver across the pair. The helper then connects his receiver to ground and, with a test prod, tests all vacant pairs until he locates the talking pair.

Death of Talbot George Martin



TALBOT GEORGE MARTIN, for 42 years intimately associated with Automatic Electric Co. and the development of the Strowger automatic telephone system, passed away at his home in Chicago, on April 10. Death came unexpectedly, as a result of a heart attack, at the age of 69. He is survived by Mrs. Martin, one son, George, and three sisters.

Mr. Martin had been engaged in a consulting capacity since the first of this year, retaining his usual keen interest in the progress and welfare of his former associates. He was a frequent visitor at the offices of the organization in whose service he had spent practically all of the active years of his life.

The news of his death, coming so suddenly, served only to increase the severity of the shock which his passing has caused, and his many friends and associates in the telephone business feel keenly a loss that even time will find it difficult to heal.

Only very recently, at one of the meetings of the Strowger Automatic Club, an Automatic Electric employe organization, Mr. Martin was made the recipient of the first of a series of annual awards named in his honor—the Talbot G. Martin Award of the Strowger Automatic Club—which is designed to be given each year to any member of the club who makes some contribution of an outstanding nature to the art of communication.

The story of Mr. Martin's career is so closely associated with the story of automatic telephony that to attempt to dissociate the two is futile. For 42 years he had lived for one idea—the perfection of the automatic telephone; and never once, even during the most discouraging periods of its development, did his faith in its ultimate success falter. His determination to "see it through," regardless of obstacles or hazards, was characteristic of every job he undertook.

Fortunately, and unlike so many other development workers who spend a lifetime in the attempt to realize some cherished dream, Mr. Martin lived long enough to see the idea for which he had labored through youth and middle age, emerge from obscurity and doubt to become one of the most brilliant inventive successes known to modern civilization.

Just how great a part Mr. Martin actually played in the development of automatic telephone equipment will probably never be known, for the system in its present form represents the work of many people. To attempt to assign relative rank to the various contributors would be a fruitless task, but any account of that development which failed to include the name of T. G. Martin as one of its outstanding authorities and inventive geniuses would be far from complete.

Mr. Martin's telephone career began in the early '90s as a trouble-shooter for the Chicago Telephone Co. Having heard of the automatic or "operatorless" telephone, which had only shortly before been given serious consideration as an economic and practical idea, he became attracted by its possibilities, and secured a position with the Strowger Automatic Telephone Exchange, predecessor of Automatic Electric Co.

This was in 1893—the year of the World's Columbian Exposition in Chicago. Mr. Martin's first job was to install and demonstrate an exhibit switchboard at the Fair. For several years following this he engineered and installed many of the earlier automatic exchanges, thereby securing a first-hand working knowledge of the equipment which became of untold value in his work of later years.

In 1904, Mr. Martin was placed in

FIG. 19. CLEARING END OF CABLE BY STAGGER-CUTTING CONDUCTORS

The principal disadvantage of this latter practice is the fact that pairs that are bad in one section of cable may be

and pairs. The helper then connects his receiver to ground and, with a test prod, tests all vacant pairs until he locates the talking pair.

Testing for Leaks in TELEPHONE CABLE with DRY NITROGEN

AIRCO Oil-Pumped NITROGEN (Dry) is used to maintain under pressure both underground and aerial telephone cables.

The method employed is simple, safe, and inexpensive. It serves not only for testing new cable leads upon installation, but also for disclosing and locating leaks that may develop in service.

Used as a cable maintenance measure, interruptions in service from water entering the cable, are reduced or eliminated entirely. For over ten years AIRCO Oil-Pumped NITROGEN has been successfully used to lower cable maintenance costs.

Details of the NITROGEN method of testing and maintaining telephone cables are contained in a leaflet, copy of which will be sent to anyone interested, on request.

AIR REDUCTION SALES CO.

General Offices: 60 East 42nd St., New York

DISTRICT OFFICES and DISTRIBUTING STATIONS in PRINCIPAL CITIES

charge of the development department of Automatic Electric Co., and was later made assistant chief engineer. Early in 1921, he was appointed chief engineer of the company, succeeding Alexander E. Keith. With the formation of Associated Electric Laboratories, he accepted the position of chief engineer, which position he held until a few months before his retirement this year.

That Mr. Martin's accomplishments during these years exerted a profound influence on the development of the Strowger automatic telephone system goes without saying. There is hardly a unit of apparatus in use today that does not bear the mark of his influence in some form or other. The earlier experiences in his career often proved of great value in guiding the efforts of his staff.

One of the marks of a truly great man is the type of organization he leaves behind him. Mr. Martin had the faculty of gathering around him a number of youthful enthusiasts, whom he was able to imbue with a considerable degree of his own energy and courage.

As a result, the organization is in a position to continue its progress in just the way that he would have wished, guided by the spirit of his own tireless enthusiasm, profiting by his own experience, and lacking only his kindly counsel and the stimulus of his personal encouragement.

COMING CONVENTIONS

Alabama Independent Telephone Association, Jefferson Davis Hotel, Montgomery, April 23.

Tennessee Independent Telephone Association, Hermitage Hotel, Nashville, April 25.

Ohio Independent Telephone Association, Hotel Deshler-Wallick, Columbus, May 1 and 2 .

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 8 and 9.

Pennsylvania State Telephone & Traffic Association, Penn-Harris Hotel, Harrisburg, May 16-18.

Up-State Telephone Association of New York, Onondaga Hotel, Syracuse, May 22 and 23.

Missouri Telephone Association, Hotel Muehlebach, Kansas City, May 27 and 28.

Pennsylvania Convention Dates Changed

Due to the fact that the Pennsylvania legislature will no doubt be in session until June 1 which causes congested hotel conditions in Harrisburg, the officers of the Pennsylvania State Telephone & Traffic Association have decided that it would be advisable to change the dates for the 1935 convention from Tuesday and Wednesday, May 14 and 15, to Thursday, Friday and Saturday, May 16, 17 and 18.

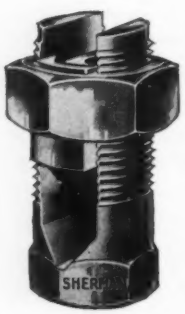
The decision to change from a two to a three-day convention is due to the fact that all of the larger manufacturers of equipment have expressed a desire to exhibit at the convention and the association feels that a two-day convention does not give the manufacturers sufficient time to contact the majority of those attending the meeting.

• • •

Recent Prices in the Metal Market

New York, N. Y., April 15: Copper—Quiet; electrolytic spot and future, blue eagle, 9.00c per lb. Tin—Barely steady; spot and nearby, 51.00c per lb.; future, 50.12c. Lead—Firm; spot New York, 3.70c per lb.; East St. Louis, 3.55c. Zinc—Steady; East St. Louis spot and future, 4.05@4.10c per lb. Quicksilver—$72.50@75.00 per flask of 76 lbs.

Small
Sherman Solderless Service Connectors
For Making Solderless Line Taps



TS-8 and TS-10 Connectors will take care of installations where No. 14, No. 16 or No. 17 drop wires are taken off from a No. 8 or No. 10 lead wire.

Tough Bronze in every part — tight contact — Bolt, Spacer and Nut, an integral assembly, assuring strength.

Write for Trade Bulletin No. 22

H. B. Sherman Mfg. Co.
Battle Creek, Michigan

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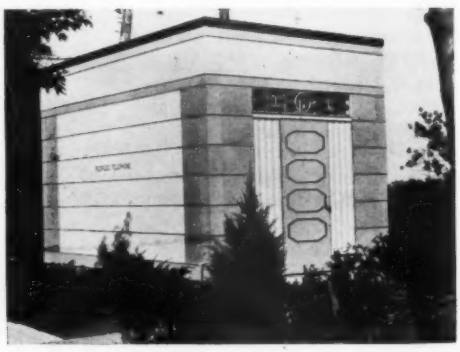

House your remote unattended dial equipment in these modern, inexpensive and altogether practical Frameless Steel Structures.

They are sturdy, attractive, dust-free and surprisingly easy to erect. Lifetime porcelain enameled exterior. These handsome, thrifty buildings have been proved worthy in every way—by the Peoples Telephone Company of Butler, Pennsylvania, and others.

Look into this greatly advanced type of construction today. And remember, the cost is reasonable. Just address your request for complete information to:

INSULATED STEEL CONSTRUCTION CO.
MIDDLETOWN, OHIO

The Manufacturers' Department

Corrosion-Resisting Steel Wire Cable Rings

An unusual application of corrosion-resisting steel has been found in its use in manufacturing cable rings for supporting lead-covered telephone and telegraph cables where severe corrosive conditions exist. The rings, as illustrated on this page, were made by the Chance Co., Centralia, Mo. It is claimed that these rings will far outlast rings made in the usual way of carbon spring wire, , hot galvanized after forming, and they are said to be especially suitable for use in industrial atmospheres, tunnels, and other severe exposures.

Corrosion-Resisting Steel Wire Cable Rings Manufactured by the Chance Co., of Centralia, Mo., for Use Under Unusual Atmospheric Conditions.

The wire from which these cable-rings were manufactured is drawn from Bethadur No. 2, Bethlehem's 18 and 8 grade of corrosion-resisting steel. The process of manufacture of the rings consists first in cold-rolling the wire to the half-oval section, and then cold forming this half oval wire into the finished rings by automatic machines.

No special equipment was necessary in making the rings, the fabricating process being the same as ordinarily followed when spring wire is used in similar work. It was found that Bethadur No. 2 wire responded so well to cold-working that the finished rings possess the same resilience as those regularly made from spring wire, and at the same time meet the severe tension and bending tests required by inspectors of utility companies.

The illustration presented on this page shows two of the rings attached to a high strength messenger strand of "C" coating Bethanized wire. The ability of 18 and 8 steel for resisting a multitude of corrosive media is well known, while "C" coating Bethanized wire is claimed to be the highest quality of corrosion-resisting zinc-coated wire obtainable. This corrosion-resisting combination offers a new opportunity for greatly reducing maintenance costs, where frequent replacements of such parts due to rapid deterioration are necessary.

• • •

New Catalog Issued on Simplex Safety Jacks

Templeton, Kenly & Co., Ltd., of Chicago, have issued their new miniature catalog, No. 235, which supersedes all previous issues. It fully illustrates and describes the Simplex screw and lever jacks, Simplex trench and timber braces which are used extensively by telephone companies and other utilities, as well as railroads and industrial concerns.

During a period of more than 36 years Simplex jacks have been building up a reputation for safety, power, simplicity and service. They were awarded the safety gold medal by the American Museum of Safety.

• • •

Virginia White Cedar Poles With Treated Butts

The spring and summer of 1935 is expected to witness the greatest revival of business since the depression started, according to some prophets, and this is particularly applicable to the telephone industry. New business requires better telephone facilities. Now that the winter is past, the time to clear-up line troubles and replace old poles and equipment is at hand.

For a number of years there has been a demand for treated poles, and Jordan Bros. Lumber Co., Norfolk, Va., has developed a method of treating Virginia white cedar poles which is said to be most effective. The poles are charred by the open-fire method and given a treatment of tar and creosote oil while hot, prolonging their life at ground line.

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ACORN ANTI-OXIDANT RUBBER COMPOUND
IS LIFE INSURANCE
for all
TELEPHONE and TELEGRAPH WIRES
DROP, BRIDLE, CROSS CONNECTING, INSIDE, ETC.
May we quote on your Insulated Wire Requirements?

ACORN INSULATED WIRE CO.
225 King Street
BROOKLYN, N. Y.

Brief Telephone News

New Companies and Incorporations

FRANKLIN, MINN.—Articles of incorporation have been granted to the Citizens Telephone Co. of Franklin, with a capital stock of $10,000. The incorporators are: G. C. Gustafson, E. F. Johnson and Arthur Larson.

Officers of the new company elected temporarily are: President, G. C. Gustafson; vice-president, E. F. Johnson; secretary, J. V. Hage; and treasurer, Arthur Larson.

Construction

DELPHI, IND.—The Carroll Telephone Co. has purchased the old post office building site on the northwest corner of the square here. The building was partly burned some time ago and the debris will be cleared for a new home for the company.

LEOTI, KANS.—C. H. Hatton, president of the Interstate Public Utilities Corp., owning the telephone exchange here, announces that the local exchange will undergo extensive improvements. Thirty miles of new line work will be installed.

MUSKEGON, MICH.—The Michigan Associated Telephone Co. plans to expend approximately $10,000 on materials for building, alterations, poles, cables and equipment to be located in the local exchange.

SHATTUCK, OKLA.—A new building is to be erected here by the Southwestern Associated Telephone Co. along the same specifications as the Waynoka exchange, according to recent information.

MILWAUKEE, WIS.—A program of expansion calling for $2,525,000 in improvements to service and additions to plant and equipment in local service during 1935 was announced late last month by the Wisconsin Telephone Co. The largest single sum will be $1,350,000 for subscribers' instruments and miscellaneous routine work.

Alterations to outside plant and equipment will cost $1,100,000. Of this amount $425,000 will be required for work necessitated by highway and other public improvements and replacements of poles.

About $875,000 will be spent for improvements and additions for long distance service in the state. Approximately $400,000 of this amount will be spent for bettering the long distance plant.

Telephones Gained

CHICAGO, ILL.—The Telephone Bond & Share Co. reports a net gain of 3,564 stations in the first three months of 1935. This compares with a station gain of 2,352 in the similar period of 1934.

COLUMBUS, OHIO—O. N. Olsen, district commercial manager of the Ohio Bell Telephone Co., in his report for March shows that the net increase in telephone stations for that month was 439, the highest for any month since 1931, bringing the total number of telephones in Columbus up to 63,459. During March in this area 1,012 telephones were connected while the disconnections numbered 573. The disconnections were the lowest for March since 1928, and in fact the lowest for any month since that time.

For the first three months of this year the report of the district manager shows the net gain in installations was 880. Connections for this period were 2,960 and the disconnections 2,080. During the same period in 1934 there were 2,735 connections, in 1933, 2,202, and 4,108 in 1930. Disconnections for the same period were 2,038 in 1934, 3,728 in 1933 and 3,700 in 1930.

Miscellaneous

BLUE EARTH, MINN.—W. A. Eckles, president of the Blue Earth Valley Telephone Co., is convalesing in the City Hospital, Salem, Ohio, from an operation for acute appendicitis. Mr. Eckles had spent February and March in Florida and was returning north when he was stricken and the operation performed on April 1. Late reports indicate he is making a good recovery and expected to leave the hospital the last of this week.

EDGAR, WIS.—Mrs. Sophia Bier, veteran telephone operator and manager of the Edgar, Wis., exchange of the Commonwealth Telephone Co., completed 34 years in the operation of the exchange on January 22. She assumed charge of the first switchboard at Edgar and served the 21 subscribers of the company. Today there are 165 telephones.

The Edgar exchange at that time was operated by a locally-owned company, known as the Edgar Telephone Co., and at the same time a long distance service was operated by the Marathon County Telephone Co.

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JOHN M. COOK
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APPRAISALS RATE STUDIES
Determination of Exchange Costs Incident to the Furnishing of Toll Service.
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Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization, and Operation of Telephone Companies.
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Buyer's Weekly Guide

A list of firms and companies offering equipment, supplies or services for operating telephone companies

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Burroughs Adding Machine Company, Second Blvd., Detroit, Mich. — Adding, Bookkeeping, Calculating, Billing and Accounting Machines, Electric Carriage Typewriters, Standard Typewriters, Operator Correct-Posture Chairs. Burroughs machines are in use today in hundreds of progressive telephone companies throughout the country.

BATTERIES—DRY CELLS

Bond Electric Corporation, 257 Cornelison Ave., Jersey City, N. J.—Bond Telephone Dry Cells, Bond Flashlights and Batteries, Industrial Flashlights and Batteries, Bond Dry Batteries, Storage Batteries, Voltpruf Special Flashlights for linemen, Victor Telephone Cells and Bond Formula 1216 Inhibitor, ideal for keeping the cooling system of trucks and service cars free from rust, scale and corrosion.

Burgess Battery Co., Freeport, Ill.—Burgess Flashlights and Uni-Cel Flashlight Batteries—for dependability and service. The Burgess Twin-Six Telephone Battery—a 3-volt unit designed to replace two No. 6 cells, with longer life, lighter weight, smaller size and a leakproof case. The Burgess Little-Six—replaces the old type No. 6 cell, is smaller and lighter, will not ooze or bulge, has all the electrical capacity of the standard No. 6 cell.

National Carbon Company, 30 E. 42nd St., New York.—"Columbia" Telephone Dry Batteries; "Eveready" Flashlights, Flashlight Batteries and Long Life Dry Cells, "National Pyramid" brushes, carbon, graphite and metal graphite for motors, generators and rotary converters. "Eveready" Prestone anti-freeze; "Eveready" Rustone rust preventive; and "Eveready" Air Cell telephone operators' transmitter batteries.

Ray-O-Vac Company, Madison, Wis.—Ray-O-Vac telephone batteries — longer life and better service proven by tests in accordance with U. S. Government standards and records of users. Ray-O-Vac flashlights and industrial flashlight batteries are other items showing Ray-O-Vac's outstanding quality.

BATTERIES—STORAGE

The Electric Storage Battery Company, Allegheny Ave. and 19th St., Philadelphia, Pa.—Exide Storage Batteries. Branches: Boston, New York, Rochester, Philadelphia, Pittsburgh, Washington, Atlanta, Cincinnati, Cleveland, Detroit, Chicago, Kansas City, Minneapolis, St. Louis, Denver, San Francisco and Seattle.

BATTERY CHARGING EQUIPMENT

General Electric Company, Bridgeport, Conn.—Tungar battery chargers. G-E pole line hardware. Cable filling compound.

CABLE—LEAD ENCASED

American Electrical Works, Phillipsdale, R. I.—Paper telephone cable, switchboard cable, bare copper wire. Chicago Office: 20 N. Wacker Drive; Cincinnati: Traction Bldg.; New York: 100 E. 42nd St.

British Insulated Cables, Ltd., Surrey House, Embankment, W. C. 2, Factory: Prescot, Lancashire, England.—Telephone cable of all sizes and capacities.

General Cable Corporation, 420 Lexington Ave., New York, N. Y.—Paper telephone cables of standardized manufacture for over forty years. Weatherproof and insulated copperweld drop wire.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Can.—For any type of wire or cable used in telephone, telegraph or power work get in touch with "Phillips." Manufacturers of bare and insulated copper wires, rubber insulated wires, enameled wire, magnet wire, telephone cables, power cables, switchboard cables, flexible cords, copper rods, etc.

CABLE RINGS

National Telephone Supply Company, 5100 Superior Ave., Cleveland, Ohio.—National Cable Rings, National Splicing Sleeves, Non-Breakable Messenger Cable Hangers, Marlin and Swisher Cable Hangers and Custom Galvanizers. National cable rings are practical because they are two-way,—they allow the cable to be pulled in either direction. National sleeves make secure the weakest points in the line. If it's a splice—make it a National.

CABLE TERMINALS

Cook Electric Company, 2700 Southport Ave., Chicago, Ill.—Protective Pole Cable Terminals, Unprotected Pole Cable Terminals, central office protection, lighting arresters, sleeves, fuses.

Reliable Electric Company, 3145 Carroll Ave., Chicago, Ill.—Complete line of cable terminals, telephone and switchboard protectors, sleeves, fuses, solderless wire connectors and specialties.

CARBON DIAPHRAGMS

Noris Carbon Company, Inc., 160 5th Ave., New York, N. Y.—Carbon diaphragms, carbon back plates, granular and globular carbons, lightning arresters.

CONDUIT

Brazil Hollow Brick & Tile Company, Brazil, Ind.—Makers of Brazil Vitrified Tile. Conduit.

CORDS, CABLE AND WIRE

Lenz Electric Manufacturing Co., 1751 N. Western Ave., Chicago—Established 1904—telephone and switchboard cords for all makes of equipment, braided and lead-covered telephone cable, flame-proof jumper wire, interior telephone wire, switchboard wire.

CORDS AND WIRE

Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago—Telephone and Switchboard Cords, Flame-proof Jumper Wire, Switchboard Wire, Interior Telephone Wire. W. L. Runzel, President, has devoted over 40 years to the making of fine telephone cords.

ELAPSED TIME RECORDERS

Calculagraph Company, 50 Church St., New York, N. Y.—Calculagraph is the world's standard elapsed time recorder and gives you toll records printed with elapsed time to the second. Both spring driven and electric motor models are available.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

Alfred E. Cowling, Scotstown, Quebec.—Eastern cedar poles, plain or butt treated.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

Michigan Pole & Tie Company, Newberry and Grand Rapids, Mich. — "Poles with Character." Northern White and Western Red Cedar. Strategically located yards, Minneapolis, Minn., and Reed City (Lower Michigan), insure quick deliveries.

Naugle Pole & Tie Co., 5 South Wabash Ave., Chicago, Ill. Northern White and Western Red Cedar Poles. Plain or butt-treated. Let us quote you our new low prices.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada — Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or Butt treated.

SUPPLIES, SWITCHBOARDS AND INSTRUMENTS

American Automatic Electric Sales Company, 1033 West Van Buren Street, Chicago, Ill.—Public Automatic Telephone Systems, Private Automatic Telephone Systems, Central Battery and Magneto Manual Telephone Switchboards, Remote Control Switchboards, Telephone Instruments of all types, Battery Eliminators, Charging Equipment, Signaling and Control Apparatus, Cords, Wires, Cables, Monotype Copperweld Drop Wire, and a complete line of construction materials and supplies.

Automatic Electric Company, 1033 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Telephones, relays, signalling and control equipment.

Automatic Electric Company, Ltd., Milton Road, Edge Lane, Liverpool, England.—Automatic Telephone Equipment.

Automatic Electric Sales Company, Ltd., 1027 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Manual Telephone Equipment, telephones, storage batteries, wire, cable, poles, etc.

Kellogg Switchboard & Supply Company, Adams & Aberdeen Sts., Chicago, Ill.—Engineers and designers, manufacturers and suppliers of complete equipment for telephone exchanges and communication systems. Manufacturers of "Master-built" Common Battery, Magneto and PBX Switchboards, "Masterphone" Telephone Instruments, and a complete line of telephone supplies, including bronze drop and interior wire.

North Electric Manufacturing Company, Galion, Ohio—Machine switching telephone systems. Automanual and Automatic. "All-Relay" Switching Apparatus (Dialless and Dial Control). Unattended Satellite Systems.

Siemens Brothers & Company, Ltd., Woolwich, England—Automatic and Manual Telephone Equipment.

Stromberg-Carlson Telephone Manufacturing Company, 100 Carlson Road, Rochester, N. Y. — Telephone apparatus of all kinds, switchboard cords, cable and general telephone supplies.

TOOLS

Crescent Tool Co., Jamestown, N. Y.—CRESTOLOY Pliers, Curved Needle Nose Pliers, Heavy Diagonal Cutting Pliers, Linemen's Side Cutting Pliers, End Cutting Nippers, Crescent Hack Saws.

TRANSMITTER REPAIRS

The Telephone Repair Shop, 1760 Lunt Ave., Chicago, Ill.—Transmitters completely rebuilt and arranged for either magneto or C. B. service. Transmitter fronts and backs refinished in black. Transmitter buttons cleaned and refilled. Receivers repaired; ringer coils and generator armatures rewound.

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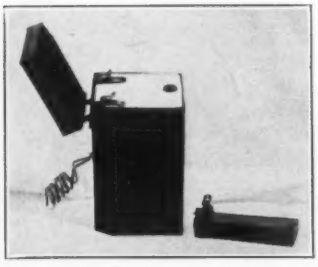

Locate cable trouble with the **CANTY FAULT FINDER.** This new cable tester operates on two dry cells and locates all cable faults (except opens). There are two binding posts for lead wires to bad cable pairs. Adjustment of tone is simple,—move lock nut up or down. Size 3"x4"x7". No telephone exchange should be without the **CANTY FAULT FINDER.** Price $12.50 postpaid complete, less head set. Address 8101, care of TELEPHONY.

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No. 12 BB Galvanized Iron Wire

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POSITION WANTED—By all around telephone man with technical, engineering, managerial experience, Bell and Independent. Have ability to place telephone properties on better paying basis. Best references. Go any place. Address 8427, care of TELEPHONY.

MARRIED man, 41, wishes position as manager of a local telephone company. Twenty years' experience, will go anywhere. Excellent references. Address 8426, care of TELEPHONY.

Competent telephone man experienced in all branches, desires position with active company. Will furnish A-1 reference; go anywhere, moderate salary. Address 8434, care TELEPHONY.

COMMISSION AND COURT ACTIVITIES

(Concluded from page 47)

company placed an unjustifiably large valuation on its properties in Louisiana and that the lowered rates would yield a fair return on actual valuation.

In denying an injunction against the enforcement of the reduced rates, Judge Jones expressed regret that Counsel Huey P. Long had refused to grant him a longer period of time than the usual three-day period, in which to study the mass of testimony presented

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Commission Rulings and Schedule of Hearings

ARKANSAS

April 4: New Arkansas Public Utilities Commission (which replaced the old fact-finding tribunal) voted to continue the work started by the tribunal in investigating rates of five utilities, which included the Southwestern Bell Telephone Co. at El Dorado.

April 17: Boone County Telephone Co., of Harrison, ordered to appear on this date before the new Arkansas Public Utilities Commission to show cause why an investigation into its rates should not be re-opened.

ILLINOIS

April 17: Hearing in Springfield on proposed advance in rates by the Illinois Commercial Telephone Co. for telephone service in Eldorado.

April 17: Hearing in Springfield on application of the Illinois Commercial Telephone Co. for authority to discontinue the telephone exchange at Downs. Case reopened on petition of subscribers at Downs and consolidated with the complaint of H. C. Baker, et al. Case Nos. 23375 and 22468, respectively.

GEORGIA

April 22: Hearing on toll rates of the Southern Bell Telephone & Telegraph Co.

MINNESOTA

April 25: Hearing in Litchfield on petition of the Acton Telephone Co. for relief from electrical interference on its telephone lines, caused by the Litchfield Municipal Power Plant lines.

MISSOURI

April 15: Hearing in Jefferson City in the matter of the reconstruction of the telephone circuit between Salisbury and Clifton Hill.

OHIO

April 12: Application filed by the St. Marys Telephone Co., and authority granted the same date, to file a new tariff effective May 1 which will establish a new five-party business classification with a net monthly rate of $3.00 and reduces by half the prevailing charge of 50 cents for an extension bell.

WISCONSIN

March 30: Community Telephone Co., operating 34 exchanges in the state, ordered to stop payment of dividends on its common stock—owned by Inland Telephone Co., of Kansas City, Mo.—until the Wisconsin commission can investigate the company's affairs.

April 11: Investigation ordered of a complaint made by W. J. MacNabb, who operates a garage three miles southeast of Madison, on highway 51. He alleges that he has been denied a telephone service hookup from Madison by the Wisconsin Telephone Co.